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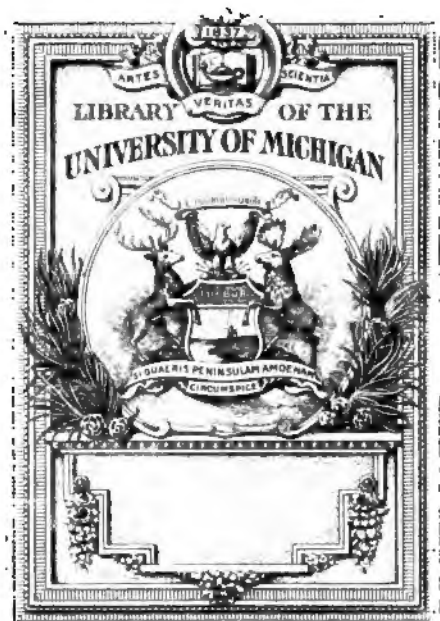
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JANUARY, 1901.

VOL. XVII.

TANGANYIKA AND THE COUNTRIES NORTH OF IT.*

By J. E. S. MOORE.

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PART I.

1. THE necessity, or at any rate the desirability, of further knowledge of the physiographical features and of the aquatic fauna and flora

* Being a Preliminary Account of the Biological, Geological, and Geographical Results of the Tanganyika Expedition in Two Parts. With Map, by M. Fergusson, A.R.S.M. Map, p. 104.

of the great African lakes grew out of what, in want of a better name, I may call the Tanganyika problem. Before my former expedition to the lake, the terms of this problem were briefly these—that there were in Tanganyika animals which had not the appearance of those which naturalists have grown accustomed to regard as almost universal and invariable in their occurrence in the fresh waters of the globe.*

Our first knowledge of this singular fact originated in Burton's celebrated journey to Tanganyika. For although it will be generally remembered that Tanganyika was discovered by Sir Richard Burton, it may not be so generally remembered that his companion Speke picked up some shells on the shore, and that these eventually found their way into the British Museum, where they are now. When examined, these shells proved to be quite unlike any fresh-water forms with which naturalists were then acquainted, but it was at once recognized that they were in their general appearance curiously marine. This fact could naturally at the time only be noted as a singular zoological anomaly, and an account of it will be found in the *Proceedings of the Zoological Society* for 1857.

As time went on other great lakes in the African interior were visited by many Europeans, but no shells were ever brought back from these lakes which at all resembled the peculiar Tanganyika forms. On the other hand, the missionaries brought further samples of shells from Tanganyika itself, and among these were forms at once so strikingly different from those of any other known fresh-water lake, and so curiously marine in aspect, that, when describing them, Mr. Smith† boldly declared his opinion that they might eventually turn out to be relics of a former sea.

Whatever interest and curiosity may have been raised at the time respecting the nature of these Tanganyika mollusca was, however, suddenly and completely eclipsed by the reported further discovery of jellyfish in the lake by the German traveller Boehm. It may, in fact, be said that it was only after this announcement that the Tanganyika problem, as such, fairly took wing. The intensification of the general interest in the fauna of the lakes which this discovery produced is not, however, far to seek; for if we accept the starfishes and sea-urchins, there is hardly any invertebrate type more typically marine than a jellyfish. Consequently the presence of jellyfishes in fresh water has always been rightly taken as an indication of the past or present connection of such waters with the sea. It need hardly be said that the idea that medusæ can be formed afresh, or can, in fact, arrive *de novo* anywhere, would revolutionize the first principles of our modern zoology in a manner for which we are, at any rate, not prepared. Boehm's

* See Mr. R. T. Günther's paper in the *Quarterly Journal of the Microscopical Society*, 1894, vol. xxxvi. p. 271.

† *Proc. Zool. Soc.*, 1881.

discovery, therefore, appeared to show that either in present or past times organisms like jellyfish could get from the sea into the lake.

Some of these medusæ were sent to England, and on examination were shown to be quite unlike any known forms, and probably of an ancient type. Nothing more, however, could be said until some naturalist visited the spot, and this impossibility of getting any further with the Tanganyika problem became the reason of my former expedition. With that expedition, however, the mystery did not end. I found that, besides the jellyfishes and the molluscs already known, there were other molluscs of a similar marine type, and besides these, crabs, prawns, sponges, and smaller things, none of which existed in Nyasa or Shirwa, or in any of the minor lakes which I had visited *en route*, and all of which could be considered as marine.

All these animals were brought home in spirit, and consequently in a condition in which they could be anatomically examined, and their affinities more or less definitely made out. Such examination showed that a number of the Tanganyika molluscs were really not allied to any of the recognized and universally distributed fresh-water types, that they could not even be regarded as the forerunners of these, but that there was much to suggest that many of them were early representatives (*i.e.* the forerunners) of the typically marine *Aphorais* type of gastropod, while others were allied to the Cerethidæ; and, lastly, one very curious Tanganyika shell (*Nassopsis*) turned out to be a highly peculiar and primitive type.*

The Tanganyika mollusca were found thus to be dissociated anatomically from those types which are almost universally distributed throughout the fresh waters of the globe, and I consequently grouped these new molluscs, together with the prawns, sponges, and jellyfishes which are peculiar to Tanganyika, as members of what I termed the halolimnic group.

Thus the view which previously had been more or less vaguely held, that the halolimnic shells and jellyfishes in Tanganyika might eventually turn out to be marine derivatives, may from this time therefore be said definitely to have taken shape, for it appeared, as a result of my first expedition, that not only were there two questionable types of animals in Tanganyika, but a whole series of marine forms living along with the fresh-water fauna of the lake, and the components of this series had the anatomical characters of a comparatively primitive marine stock.

In publishing these further observations relating to the marine nature of the halolimnic fauna before the Royal Society in 1898,† I found,

* "The Molluscs of the Great African Lakes," by J. E. S. Moore. Parts i.-iv. (*Quart. Journ. Mic. Soc.*, vol. xli. p. 159).

† "On the Zoological Evidence for the Connection of Lake Tanganyika with the Sea" (*Proc. Roy. Soc.*, vol. lxii. p. 451).

however, that I had unwittingly run amuck among some cherished geological ideas; for it appears that in 1852, Sir Roderick Murchison,* collecting such geographical and geological facts as were available, had come deliberately to the conclusion that the interior of Africa had never been beneath the sea, and, as he then stated, "this view is now confirmed by the absence south of the equator of all those volcanic activities which we are accustomed to associate with oscillations of *terra firma*." The first part of this statement appears, therefore, in the light of the newer zoological evidence, to be wrong, on account of the anatomical characters of these molluscs, which relegate some of them definitely to marine types, thereby showing that this part of Africa has been at some time connected with the sea, in order that marine animals could get into it. The second part of the statement, that is, the evidence drawn from the then apparent absence of volcanic activity south of the equator, is now entirely disproved—

(i.) By the discovery of huge active volcanoes north of Kivu, as well as—

(ii.) By the discovery of recent cones, all round the northern coast of the Albert Edward lake.

(iii.) By the lava-fields on the west of Tanganyika.

(iv.) By the groups of volcanic cones north of Nyasa.

(v.) By the presence of volcanic activity as far south as Shirwa; and finally,

(vi.) By the demonstration of the existence and continuance of those very oscillations of *terra firma* which in equatorial Africa were said not to exist, and on a scale almost unprecedented elsewhere in the world, *i.e.* in relation to the great rift-valleys.

In a number of subsequent papers dealing with different portions of the same problem,† I therefore reiterated what I had already said about Tanganyika having at some time been connected with the sea, for the existence of the *Medusæ* and the marine gasteropods in that lake cannot be blinked, however desirable such a proceeding might be for the sake of the reputation of some existing geological conceptions; while, as a matter of fact, the newer geological facts are not opposed, as Sir Roderick Murchison and, with curious inconsistency, some of his disciples have insisted, to those "oscillations of *terra firma*" which are necessary in order to bring such a condition of things about.

Considering the strength of the zoological case, where the most weighty kind of positive evidence it was possible to get was matched against nothing better than negative zoological appearances and certain crude theoretical anticipations, we should have been quite justified in holding that the older geological position must be wrong, had no further

* Murchison, President's Address, *Proc. R.G.S.*, vol. xxii. (1852).

† "The Molluscs of the Great African Lakes," parts iii.–iv. (*Quart. Journ. Mic. Soc.*, vol. xlii. pp. 187, 201).

zoological evidence in support of the marine origin of the Tanganyika fauna appeared. Happily, however, a fresh series of facts came to light, which are not only singular and interesting in themselves, but which, if the palæontological methods at present in vogue among geologists can be trusted, seemed to open up a royal road towards the solution of the whole Tanganyika mystery.

It was found that the shells of the halolimnic series in Tanganyika, when viewed collectively, presented a very remarkable faunistic character, a typical *facies*, as the geologists express it, and in the light of this fact the anatomical demonstration of the ancestral character which belongs to these molluscs eventually bore further fruit. It led me to suppose that the whole halolimnic fauna, or a portion of it, might belong *in toto* to some former geological age, and on examining the conchological representatives of the different geological eras, I found that this peculiar character of the Tanganyika shells was exactly repeated among the fossilized remains of the old Jurassic seas. So complete and startling is this comparison, that most of the halolimnic shells which are now living in Tanganyika are not to be distinguished specifically from their marine Jurassic counterparts.*

So far as I know, this latter view of the matter, which places the origin of the halolimnic fauna so far back in the remote past, has not been, and, unless some very startling fresh evidence comes to light, cannot be, seriously controverted, while in it we have, as I pointed out, an explanation of the particular problem which it was originally sought to solve. For the halolimnic fauna, or at least a part of it, can be regarded as a relic of the time when the seas of the Jurassic period were connected more or less closely with the lake basin. There is no legitimate reason which can be urged against the possibility of ancient types persisting under abnormal conditions. The facts, indeed, are exactly the reverse, and show that in all parts of the world extremely ancient types may become protected and perpetuated indefinitely.

2. It must not, however, be supposed that since the publication of Sir Roderick Murchison's views African geology has in any way stood still; indeed, some most valuable and interesting additions have been recently made towards the interpretation of the peculiar features of the very regions with which we are now concerned, most notably by Sues, who showed that Tanganyika lies near the south end of the westernmost of two great series of valleys which run from the south through Central Africa, like two vast converging horse-troughs, and join together in the region of the upper Nile. Thence they pass to the Red sea near Berber, continuing as the valley of this sea itself as far as the Gulf of Akaba, and even through the Dead sea to the valley of the Jordan. In the western arm of these great valleys north of Tanganyika, there are a

* "On the Hypothesis that Lake Tanganyika represents an old Jurassic Sea," by J. E. S. Moore (*Quart. Journ. Mic. Soc.*, vol. xli. p. 303).

number of lakes, Kivu, the Albert Edward Nyanza, and the Albert Nyanza being the most conspicuous.

After returning from my first expedition, none of these more northern lakes were zoologically known, nor had the other great lakes, the Victoria Nyanza and the chains of lakes in the eastern arm of the rift, been sufficiently minutely examined to show whether the halolimnic fauna existed in any of them or not. When, therefore, we took into account the fact that both the great rift-valleys united to the north and extended as far as the site of the Red sea, it appeared, on the face of it, at least possible that the halolimnic fauna, or something equivalent to it, would be found in the lakes immediately to the north of Tanganyika, whenever these lakes came to be explored, and that the rift-valley itself might possibly turn out to be the channel by which the sea had reached the lake.

If we were right in supposing that the halolimnic fauna was the relic of that of an old Jurassic sea, it appeared further probable that in Tanganyika itself, of which we then knew very little, and especially in the zoologically unknown lakes immediately to the north, there might be animals of intense zoological interest, and, therefore, that further exploration of Lake Tanganyika and the zoologically unknown lakes further north was a most attractive and promising undertaking as a zoological speculation. In any event, if such an exploration were undertaken, it would, as I pointed out in *Nature*, result in the collection of a mass of material and observations which might mark an epoch in the history of the scientific exploration of the African interior, and which would, at any rate, enable us afterwards to speak definitely about a large number of matters which were vital to the questions in hand, but which up to that time had remained unanswerable.

In order to compass this fresh investigation, Prof. Ray Lankester formed a committee consisting of himself, Sir John Kirk, G.C.M.G.; Sir William Thistleton Dyer, K.C.M.G.; Dr. P. S. Slater, F.R.S.; Mr. A. Boulanger, F.R.S.; and by their united efforts the necessarily large funds were eventually got together, and I was despatched in charge of the present expedition in May, 1899. My instructions were—

(i.) To pursue further the investigations of the fauna, flora, geography, and geology of Tanganyika; and (ii.) to go north with the same objects, *via* Kivu and the Albert Edward Nyanza, as far as the Albert Nyanza.

A large stretch of this country north of Tanganyika was almost unknown and uncharted, and thus the proposed journey offered exceptional opportunities for geographical work in the hands of a competent surveyor. It was this part of the expedition which gave it a distinctly geographical interest, and enabled it to be supported by a very liberal grant from the Royal Geographical Society. I therefore propose, in the present paper, to lay especial emphasis on the geographical results of this journey, but to give also in outline the

general tenour of the scientific work that was done about Nyasa and Tanganyika in the south, and throughout the country north as far as the Albert Nyanza, and in the Mountains of the Moon.

The composite mode of treatment thus entailed is, unfortunately, in the present case inevitable, for it is impossible either to interpret or even comprehend the geographical features of an extended district, unless we have at the same time a tolerably complete geognosy of this particular strip of the Earth and all that in it is. Our journey was taken up the Zambezi river, through the region of lakes Nyasa, Tanganyika, Kivu, the Albert Edward and Albert Nyanzas, returning by the Victoria Nyanza and Lake Baringo to the coast at Mombasa, and it will be convenient to treat the districts in this order as we proceed. Nyasa, the first lake, had of course been previously zoologically explored, to a certain extent, by Sir John Kirk and Sir Harry Johnston, but there were, when I visited it in 1899, still many points which required further elucidation.

3. On my former visit, I had found, during a stay of seven weeks on the lake, that both its vertebrate and invertebrate fauna consisted of typically fresh-water forms; that these forms were similar to the fresh-water types, occurring in the remaining African lakes, which were at that time known; and, so far as my dredging operations had gone, the mollusca appeared to be restricted to the shallow littoral portions of the lake. I found, further, that Nyasa contained no prawns, no jelly-fishes, nor any of the peculiar halolimnic molluscs which inhabit Tanganyika, and that the character of the Nyasa fauna showed that this lake was, and always had been, entirely different from Tanganyika in this respect.

The results of these observations, together with the bathymetric tables which I constructed, were published in 1899. On the present expedition the results obtained in Nyasa entirely confirmed these former views of the zoological nature of the lake. The better sounding-gear with which we were equipped showed also that the lake attained a maximum depth of 430 fathoms, extending over but a small area, oval in shape, which lies opposite the great mountains, a little to the south of Nkata bay. The remainder of the lake had been already fairly completely sounded by different officers in charge of the gunboats, and depths of 200 to 250 fathoms occurred, increasing from south to north. These observations were confirmed in the north during the present expedition, where, 9 miles off the Livingstone range, we obtained soundings of 270 fathoms. And, further, what is very remarkable, the lake has here a clean rocky bottom. I have referred elsewhere to the limitations which were set to our investigations in Nyasa; but by the use of an ordinary boat and lines I was able to confirm the fact that below water of 100 fathoms, and generally below water of 50 fathoms, Nyasa is without life of any kind.

Thus it may be taken as an established fact, that Nyasa, notwith-

standing its enormous size and its apparent age, has still the character of a typical fresh-water lake; it shows no trace of the prawns and jellyfishes, nor of the halolimnic mollusca which are found in Tanganyika; and, moreover, that the characters of both the vertebrate and invertebrate population of Nyasa, geologically speaking, appear to be of no great antiquity.

It was found, further, during our journey about the lake, and from thence to Tanganyika itself, that Nyasa certainly does lie in the southern extensions of the same series of faulted-valleys that also contain Tanganyika, but notwithstanding this, the valleys of the lakes are not continuous. That of Nyasa extends more or less completely all the way to the valley of Lake Rukwa, but this valley, although not more than 40 miles from the great depression of Tanganyika and parallel with it, is separated from it by a series of high ridges of old granitoid rocks. On this high ridge or neck of land there are to be found no traces of any old lake deposits, and where the lumpy eruptive masses of which it is composed pierce the old red sandstone formations surrounding the south end of Tanganyika, these formations lie horizontal and undisturbed about their bases, thereby showing that the eruptive protuberances on which they rest are even older than themselves.

4. The maps which accompany this paper do not need much discussion in their agreement or disagreement with those already published. In this they speak for themselves, but it may be pointed out that they cover the districts from the north of Tanganyika to the Albert Nyanza. No large alteration has been rendered necessary in the general contour of the Tanganyika itself, but the whole of the northern coast-line has been found to be further to the east than was anticipated, the observations upon which this change is based having been published in a note in the Royal Geographical Society's *Journal* in April, 1900.

From Tanganyika to the Albert Nyanza the map work is in a great measure entirely new. It will be found not altogether in agreement with Götzen's transverse route survey of the north end of Kivu, nor with the dispositions given by him of the volcanic cones north of the lake; and it is in very pronounced disagreement with the small map recently published in the Royal Geographical Society's *Journal* by Mr. Grogan. Our observations come again into agreement with those of the older workers at the south end of the Albert Nyanza and at the north of the lake; but some new material has been added in the neighbourhood of the Mountains of the Moon, continuing Stuhlmann and Scott Elliot's work upon the same region.

Each map is accompanied by a small inset representing roughly the geology of the districts included, and the whole of this cartographical work, with the exception of that about Ruwenzori, for which I am responsible, has been completed from a large number of very careful

observations made by Mr. Malcolm Fergusson, who acted as geologist and surveyor to the expedition.

In the course of our journeying about Tanganyika, we have been able to add a large number of topographical, and especially geological, observations concerning the shores of the lake, and these in the main will be found to amplify and co-ordinate the hasty description given by Joseph Thomson, hitherto practically the only geological observations about the region which we had.

Briefly summarized, the geology of Tanganyika, which is one of extreme simplicity, shows the basin to be a depression of an immensely long and narrow tract of country, all of which has sunk to a greater or less degree relatively to the level of the surrounding tablelands, and forms the bottom of the lake. In consequence of this circumstance, there exist all round the shores immense lines of cliff exposures, which show that the plateaux themselves are composed of a base of eruptive material, over which there lie, especially to the south and west, enormous deposits of reddish sandstones, conglomerates, and quartzites.

Near the southern end of the lake these stratified masses are exposed to a depth of over 2000 feet, and they are probably of enormously greater thickness. These deposits, moreover, extend to an unknown distance west, and appear to fringe a part at least of the great circular cavity of the Congo basin. They appear, further, to be continuous with the beds which extend south into the northern portion of the Nyasa district, and which at Mount Waller, as I have previously shown,* cross the lake in the form of a narrow sedimentary neck among the surrounding granitoid hills, and pass thence to an undetermined distance east. Everywhere, where we have encountered them, these deposits appear to be entirely unfossiliferous, and consequently they cannot be relegated to any geological formation with which we are acquainted; but they are certainly the oldest deposits of this part of the interior, and in places are unconformably overlaid by a number of newer beds, such as those about the north of Nyasa in which the ganoid bones and scales described by Dr. Traquair were discovered, as well as a number of molluscs of doubtful nature.

Whatever these particular beds may be, some of those which overlie the old sandstones between Nyasa and Tanganyika are certainly lacustrine, as are also those found in a similar position about Maswa on Tanganyika, where we found numerous crab-markings; and, again, between Ujiji and the north end of Tanganyika, I found recently elevated deposits containing abundant fossiliferous remains resting unconformably upon the old conglomerates and quartzites, which are here very much contorted, and form the crests of the rift-valley escarpments over 7000 feet in height.

With respect to the often disputed character of the outlet of

* *Geographical Journal*, 1897.

Tanganyika, which has again and again been described as sometimes flowing into the lake, sometimes as flowing out of it, sometimes flowing neither way, we found the Lukuga to be at present an outflowing stream, while the bar mentioned by Mr. Wallace as having been seen by the French fathers consists of a number of ridges of exposed conglomerates, which have evidently been formed at the bottom of the lake. The river finds its way out over these as a stream about the size of the Itchen, and crosses a flat sandy plain to the low sandstone hills, which here bound Tanganyika to the west. The escarpment of these hills follows the trend of the rift-valley, and they gave me very forcibly the impression that they had been faulted and upraised along this line, having once formed a portion of the old lake-bed, continuous with the flat sandy plain which runs up to their base. The Lukuga flows through them in a cutting, on the sides of which there are great pot-holes and other remains of furious water-action 100 feet above the present river, and it consequently follows that the river and lake must, when these effects were produced, have been 100 feet and more higher than they are now, or that the scarp of sandstone must have been gradually raised, the river cutting its way down nevertheless. I believe this last to be the case, for there is on Tanganyika, as on Nyasa, abundant evidence of local upheavals and depressions going on at the present time. Thus, during my march from Ujiji to the north end of the lake, I came across beds of conglomerates and sandstones tilted up in the same way as the scarps of the rift-valley hills behind them, 80 feet or more above the lake, and in which were the almost fresh remains of Tanganyika shells.

It will thus be seen that the present outlet of Tanganyika flows through a portion of the floor of the old lake, which has become faulted up into a wedge of soft reddish sandstone between the eruptive ranges north and south, and that consequently it is in the highest degree probable that the lake in the past extended at this point far to the west, a most important deduction, as we shall see.

5. North of Tanganyika the great valley of the lake is continued as a trough-like depression among the surrounding high plateaux, and beyond the lake itself it is floored with a flat mass of lacustrine and alluvial deposits covered with euphorbias and grass, and which extends for some 30 miles north of the lake.

In many places the Rusisi river has made deep cuttings through these beds, and along them I found many remains of Tanganyika shells, so that we may say with certainty that Tanganyika has at some time extended as far north as this point. Here, however, the valley is abruptly cut by a number of huge ridges, similar in their configuration and in the eruptive nature of the rocks of which they are composed to the hills of the surrounding plateaux. On these ridges there are no traces of lake deposits to be found, and they form in fact a natural dam,

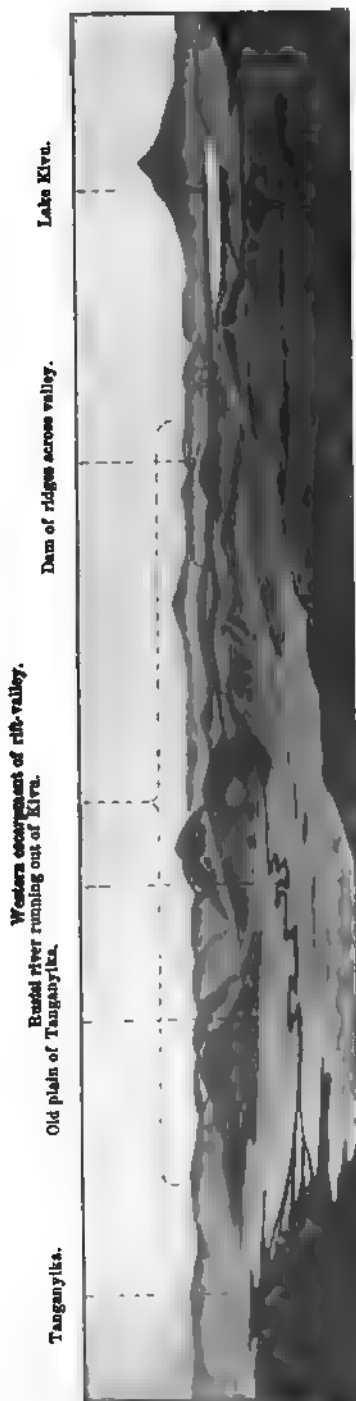
which holds up the waters of Lake Kivu to the height of nearly 5000 feet on the other side of it. Over these ridges the Rusisi river, which runs out of Kivu into Tanganyika, cuts its way down to the old alluvial extensions of Tanganyika 2000 feet below, through a succession of steep gorges, and at its source at the extreme south end of the lake forms a torrent roaring out over a foam-flecked channel among the hills.

The shores of Lake Kivu are formed by a continuation of the great Tanganyika trough, which from this point onwards cuts its way northward through what appears to be a uniformly unbroken series of eruptive granitoid plateaux, which stretch in unbroken monotony east and west of the valley as far as the coast of the Albert Nyanza itself.

6. The valley of Tanganyika, although it belongs to the same watershed, is, as will have been seen from the above, physically discontinuous from that of Kivu, and apparently always has been, just as that of Tanganyika is discontinuous from that of Nyasa and the depressions to the south. In conformity with this view, it will be found that the appearance of Kivu at the present time is very peculiar. It seems, so to speak, to be a depression which is full up to the brim, and the channel of the Rusisi river has all the appearance at its upper part of being, geologically speaking, of very recent date. This peculiar fulness of Kivu, and also its present connection with the Tanganyika watershed, are both, I believe, due directly to the enormous recent geological changes which have been and are still going on in the continuation of the valley immediately to the north of the present lake.

7. Our route lay directly through the volcanic district first described by Götzen, and more recently visited by Captain Bethe, and lastly by Mr. Grogan, but neither of these travellers has, to my mind, drawn sufficient attention to the colossal magnitude of the volcanic cones and the general evidence of volcanic activity in this remote region of the African interior. The volcanoes themselves are, moreover, extremely interesting; not only because they are almost unique in their great distance from the sea, but also because they are among the very largest active cones in the Old World. The two active cones of the series are, moreover, of further interest, in that they are in a condition rarely met with in active volcanoes of similar magnitude in other parts of the Earth. They are, in fact, as it were embryonic in character, their form representing the condition of things which appears in the old walls of the Monte Somma crater, which surround the present active cone of Vesuvius.

Certainly Kirungu-cha-gungo, the active cone originally described by Götzen, is still in the same condition that was produced by the first outbreak of activity, and is in no way disfigured by the products of dwindling activities which obscure the original characters of most of the better-known volcanoes. This mountain is a single huge cone, rising to the crest of a circular and unbroken rim, which, at the point



Western escarpment of rift-valley.

Rusizi river running out of Kivu.

Old plain of Tanganyika.

Tanganyika.

Lake Kivu.

Dam of ridges across valley.

SEMI-DIAGRAMMATIC VIEW OF RIFT-VALLEY, NORTH, FROM THE NORTH END OF TANGANYIKA TO THE SOUTH OF LAKE KIVU, SHOWING THE DAM ACROSS THE VALLEY BETWEEN THE TWO LAKES.

Eastern escarpment of rift.

we reached, after an abortive attempt, was 11,350 feet in height. It encloses a vast circular cavity over a mile in diameter, which was full of steam and smoke, so that we were unable to make any observations of the present nature of the crater floor or of its interior walls. The crater is, however, of enormous depth, for stones rolled over the edge of the huge chasm merely bounded away from rock to rock, their concussions becoming fainter and fainter, until finally they disappeared wholly from either sight or sound.

Kirungu-ndogo, which is now a cone at least 11,000 feet in height, and a little to the north-west of Kirungu-moto, was described by Götzen, and has not been formed since his visit, as Mr. Grogan appears to suggest. It is now active and fiery, the recent lava-streams round its summit giving out dazzling white jets of steam.

As I have said, the line of activity of these eruptive efforts lies transversely to the axis of the great valley of the lakes, and the activity itself appears to have proceeded from east to west, for we have to the east of the active cones a number of lofty extinct peaks, one of which is often snow-capped, and must attain a height of not much less than 14,000 feet.

The craters of these older cones are filled up with the products of secondary eruptions, which form now their present

wild pointed summits. To the south, the ash and lava streams flow down to and form the whole of the northern shore of Lake Kivu, and on the north similar streams of ash and lava flow down the valley for many miles, reaching in places the low plains bordering the southern shores of the Albert Edward Nyanza.



NORTH END OF LAKE KIVU, WITH THE ACTIVE VOLCANO KARUNGU-CHA-GUNGU IN THE DISTANCE.

Such, then, briefly stated, is the nature of the modern volcanic dam which holds up Kivu at its present abnormal level, and as we passed northward through the dense forest of the volcanic slopes, the great valley of the lakes became once more visible before us as an interminable trough, fringed by lines of green hills and scarps on either side, and flooded by the low, dry alluvial plains which gradually dip under the waters of the Albert Edward Nyanza in the north.

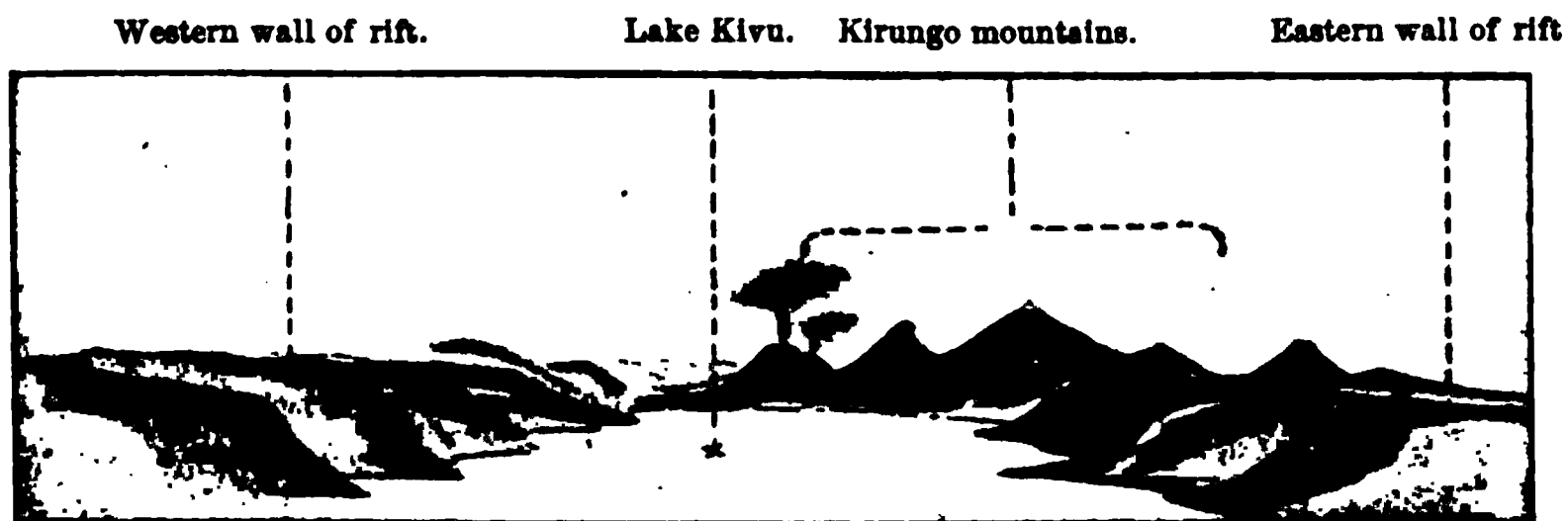
It is thus obvious that enormous quantities of volcanic matter have been recently poured into the rift-valley immediately north of Lake Kivu, and have filled the valley up to a great height, and it is on this account, I believe, that the lake appears to be full, and for the same reason the Rusisi outlet to the south has, I believe, been recently acquired, and is, geologically speaking, quite new.

I do not think that there can be any doubt that the volcanic mass has acted in this way as a dam across the valley, causing the lake to rise and ultimately flow over to the south, its connection with Tanganyika and with the Congo watershed being thus secondary, and of quite recent origin.

8. These are the physiographical facts. Let us see, then, what the zoology of Kivu has to say with respect to the former physical dissociation of the Tanganyika and Kivu valleys. The zoological evidence is in this case happily very definite, and wholly of one kind. In Kivu there is a typical fresh-water fauna; it is, in fact, that of a great pond, in which there is not the least trace of the halolimnic constituents which render Tanganyika so perplexing. But before accepting this as the final teaching of the Kivu fauna, we must take it into account that it is quite possible that the volcanic disturbances to the north may have killed off the old inhabitants of the lake, and that what we find now are merely recent immigrations from the surrounding streams. It is thus obvious that before we can be certain that Kivu originally belonged to the lakes on the Nile watershed, we must acquire a knowledge of the fauna in the lakes and in the deposits which lie along the same valley beyond the volcanoes on the north, namely, in the region of the Albert Edward Nyanza and the Albert Nyanza.

Having passed northward until one is clear of the lava and ash, these plains are seen to be very similar to those stretching north from Tanganyika. They are similarly composed of alluvium and lake deposit, and they run under and disappear beneath the volcanic material in the south. In places I found fossiliferous remains among these beds, but there are no traces of halolimnic forms among them, and the shells are similar to those now existing in Lake Kivu, so that the invertebrate life in the water which once covered these plains was similar to that of Lake Kivu at the present time.*

Before the formation of the present volcanic dam, there were, then, waters north of it in which the life was similar to that of Lake Kivu, and consequently quite unlike that of Tanganyika to the south. In conformity with this evidence, we found that the Albert Edward Nyanza



SEMI-DIAGRAMMATIC VIEW OF THE NORTH END OF LAKE KIVU, SHOWING THE WALLS OF THE RIFT-VALLEY AND THE LINE OF ACTIVE VOLCANOES LYING TRANSVERSELY ACROSS IT.

* It appears, from Mr. Boulenger's examination of the fishes which I collected in Lake Kivu, that there is in this lake one small fish which has come up from Tanganyika, one from the Nile, and the rest are closely related species, but endemic in the lake. They probably really belong to the rivers of the adjacent country.



LOADING THE BOATS AT THE EXTREME SOUTH END OF THE ALBERT EDWARD NYANZA.

also contained a fauna which is for all practical purposes identical with that of Kivu.

Kivu and the Albert Edward Nyanza to the north are thus faunistically connected, and the old physical connection of their basins is represented by the alluvium and lake deposit which underlies the modern volcanic dam. Further than this, however, we found that along the shores of the Albert Edward lake there is abundant evidence of a great fall in the level of the water; that in fact, like Tanganyika, only more so, the lake is a mere shadow of its former self. On the north the Albert Edward Nyanza is now bounded by a succession of low cliffs and profound swamps, the cliffs in some places are composed of old lake-deposit, and in others of volcanic ash. In general, the ash overlies the lake-deposit, and both together after the fall of the water have been worn down by the lake surf into low bluffs. The aqueous deposits in the cliffs contain shells, and these shells are similar to those now living in the lake. The valley of the Semliki river, which extends to the Albert Nyanza, is composed entirely of these more or less modern deposits, now covered with forest and a profusion of marshy growths.

From these observations it is obvious that the Albert Edward Nyanza must have extended towards, if it was not continuous with, the Albert Nyanza, and on reaching this lake I again found that the fauna was practically similar to that of Kivu and the Albert Edward Nyanza itself.

Thus it appears, from the zoological evidence recorded in these regions, indisputable that the whole of the floor of the rift-valley, from the south of Kivu to the north of the Albert Nyanza, a distance of some 350 miles, has at some time or a succession of times been covered with water; and that such water has contained always, and at all times, the same typically fresh-water fauna which at present peoples the three lakes which now exist there, namely, Kivu, the Albert Edward Nyanza, and the Albert Nyanza. The whole of this stretch is therefore zoologically similar throughout, and quite distinct from that of Tanganyika—as distinct from it as is the Bukwa-Nyasa stretch further to the south. The greater part of this portion of the rift-valley, i.e. the portion north of Kivu, still belongs to the Nile watershed; but Kivu has been isolated and cut off by the modern volcanic dam; but it cannot have had a prolonged connection with Tanganyika by means of the existing Rusizi channel, or it would inevitably have become profusely contaminated with the components of the fauna peculiar to Tanganyika, and at present it is not so contaminated.

Thus the zoological observations which we collected in this region north of Tanganyika entirely confirm the view which the physical characters of the environs of Lake Kivu produce, namely, that this lake at some time not very remote belonged to the Nile series.

9. In the foregoing paragraphs I have used the zoological evidence which we obtained in the region north of Tanganyika, in support of



VIEW OF THE WEST COAST OF THE ALBERT EDWARD NYANZA.

the impression which the physiological features of this country produce, and it will, I hope, have become apparent that it gives certainty to the interpretation of the geographical conception of the past and present position of the central watershed, which otherwise would still have remained in doubt. But it will also have become obvious that the new zoological results which I have brought forward, have a most direct bearing on the original biological problems that were before us when the present expedition set out. From what has been said respecting the purely fresh-water character of the faunæ of Kivu, the Albert Edward and the Albert Nyanzas, it will be evident that the original connection of Lake Tanganyika with the sea was not along the course of the rift-valleys; in fact, in a zoological sense Tanganyika is as distinct from Kivu and the lakes to the north as it is from Nyasa Rukwa and Shirwa to the south. Tanganyika, on the other hand, has, as we should expect, many fishes and some sponges corresponding to forms which exist in the Congo, and I may call attention here to the very singular correspondence which exists between the spicules of the Congo sponge *Potomalepus* and those of the crag fossil.

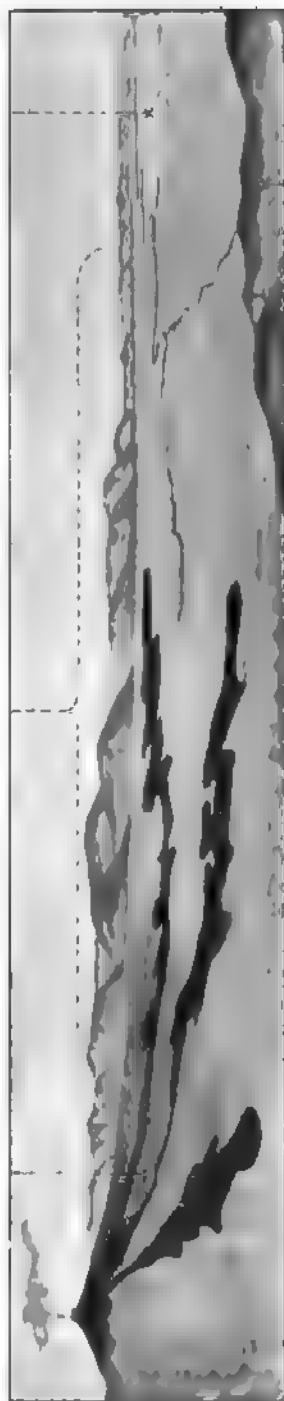
There is no vestige of any of the halolimnic animals in any of the lakes in the rift-valley north or south of Tanganyika, but this fauna does appear to extend into the Congo valley, and consequently, when we come finally to the question in what direction Tanganyika was stocked from the sea, I would emphasize the fact that we saw, when dealing with

No. I.—JANUARY, 1901.]

Albert Edward Nyanza.

Western edge of rift-valley beyond volcanic dam.

Modern volcanic dam on troughs of rift-valley.



SEMI-DIAGRAMMATIC PANORAMIC VIEW OF RIFT-VALLEY NORTH OF THE KIBUNGU MOUNTAINS, AS FAR AS THE ALBERT EDWARD NYANZA.

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the geological topography of Tanganyika, that the lake had at some former time extended far to the west of its present site in the neighbourhood of the Lukuga. It is only necessary for such an extension to cover some 80 miles to bring it into communication with the great circular basin of the Congo itself. Much of this basin has been covered by the sea; how much and at what different times is, however, like too much else at the present time, a matter of geological dispute; but since the depression of the Congo has been, in part at least, submerged beneath the sea, and since it extends close to the old western extension of the lake, and, lastly, since the halolimnic fauna does not extend north, as was anticipated, I am strongly inclined to suppose that at some time the lake was continued into the Congo basin.

It is lastly a matter of considerable importance that among the other results of the expedition it has now been definitely proved that, with the solitary exception of Tanganyika, the halolimnic fauna does not exist in any of the larger and more permanent African lakes, whether they belong to the rift-valley series or not. I can personally vouch for its non-existence in Nyasa, Shirwa, Kivu, the Albert Edward Nyanza, the Albert Nyanza, the Victoria Nyanza, and several of the minor lakes both in the eastern and western arm of the rift, all of which I have personally examined. It is also clear, from Captain Wetherley's observations, that it does not exist in Bangweulu, nor in Mweru, and from the observations of Mr. Harrison and others on Lake Rudolf, it is equally clear that it does not occur in either. We have thus disposed of the last fragment of evidence in favour of the view held by some geologists, that the halolimnic fauna might be a remnant of an older fresh-water fauna, different in character from the freshwater faunæ which now exist, but which was once general in Africa; for if this were so, some at least of the halolimnic types would be present in the other great lakes, which, for any shadow of evidence there is to the contrary, may be older than Tanganyika itself. Such forms are not, however, present even among the fossils in the beds which old lakes long since departed have left behind them in Africa, and some of these deposits may be even pre-tertiary in date.

PART II.

1. It will have become evident, from what has been already said in the first part of this paper, that the great valley of Tanganyika, which begins in a number of little parallel faults just south of the lake, is traceable as a vast flat-bottomed trough as far north as the Albert Nyanza, and that its floor, but not its trough-like sides, is interrupted at two points, one north and the other south of Lake Kivu. That to the south appears to have been permanent since the geological movements took place, which gave rise to the valley itself. That to the north



THE STEEP COAST ON THE WEST OF THE ALBERT EDWARD NYANZA

has not been so, but is composed, as we have seen, simply of a heap of recent volcanic matter thrown up from a number of still active vents.

When we reach the northern shores of the Albert Edward Nyanza, the eastern wall of this great valley is seen to lie at a considerable distance east of the shore of the lake, and immediately to the north and lying against the eastern edges of the rift are the towering ranges of the Mountains of the Moon. These ranges run parallel with the edge of the rift-valley, and rise to the west from it, and consequently they stand between the Victoria plateau and the bottom of the trough, which is formed by the flat green marshlands of the Semliki valley. When viewed from the south, the Ruwenzori range therefore appears as a vast buttress standing out into the trough at this point, and soaring over its edges in the succession of snow-peaks for which it is so justly famed. At first sight these huge ranges, which rival the Alps in magnitude and in the sublimity of their scenery, appear to have nothing in common with the plateaux or the valley. Thus Stairs, who ascended the north-western end of the range to a height of 10,000 feet, came to the conclusion that the different snow-peaks which he saw were so many fragments of the broken rim of an old volcano. Stuhlmann, on the other hand, who made a desperate attempt to get up to the snow from the west, thought the whole range to be a "faltungsgebirge;" and Scott Elliot appears to have adopted a modified form of this view, although, as we shall see later, neither explanation appears to fit the facts of the case. The best existing map of these mountains,

that published in Mr. Scott Elliot's book, represents the lower portion of the range fairly correctly in outline, but gives one the impression, either intentionally or not, that there is a sort of high tableland in which all the slopes terminate, and which on the map covers some 20 miles by 6. On this plateau the snow lies, and up to the time of my visit no one had reached it. That this view of the nature of the range is not correct will be evident from the following description of my ascent of the northern snow-ridge of Ingomwimbi. As this account deals with an entirely new piece of work, I have thought it better to give it in full, before drawing whatever conclusions are legitimate from the features that were observed.

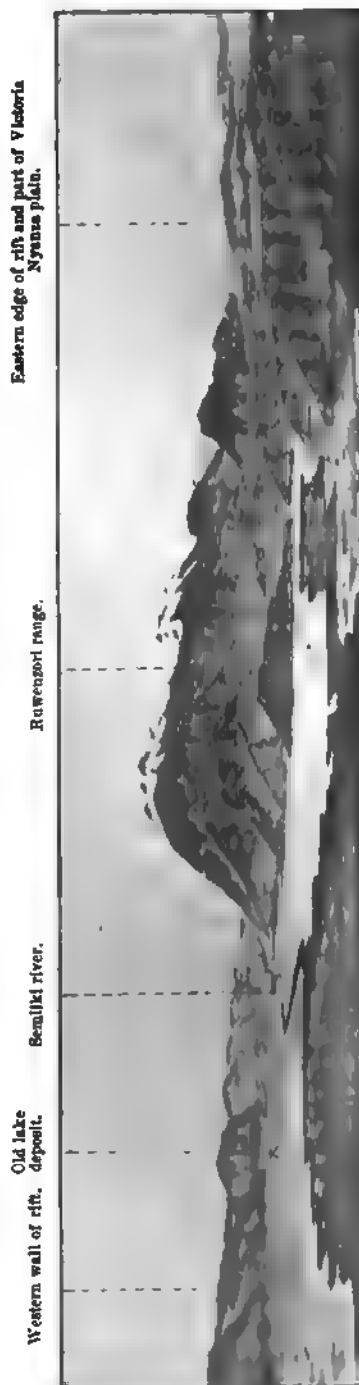
2. Our first view of the range was obtained along the route from Katwe, on the Albert Edward Nyanza, to Fort Gerry, just beyond the Mobuko river. Here, in the afternoon, the mist lifted after a succession of wild rain-storms, and one could see immediately to the west the dark outlines of huge precipitous mountains, stretching far back into the drifting cloud and rain.

The persistence of heavy rain upon the mountains was extraordinary, and I thought it boded ill for the attempt I meant to make upon the higher peaks. In two more days we reached Fort Gerry, and Mr. Bagge was kind enough to lend me one of his head boys, who was a native of Toro, and could speak the language of the hill-tribes, and who had



CROSSING THE ALBERT EDWARD NYANZA.

accompanied him when he explored the Nyamwamba valley as far as the bamboo zone. After his master descended, this boy had gone on by himself as far as the heath, some of which he brought back. His story of the solitary climb he made was somewhat amusing. He told us that the journey was not at all one for any white man, and that after he left Mr. Bagge he climbed through the bamboos till he came to the heath zone, and finally into an amphitheatre of snowy mountains with a lake at the bottom of it, beside which he rested, and then returned. Round the lake, he said, were a number of great black birds, bigger than sheep, which belowered like bulls. He said, further, that he did not think the ascent of any of the mountains near the lake would present any difficulty, as the tangle of heath ended by the lake, and beyond this there was nothing but slopes of rock and stone. I therefore decided to go up the Nyamwamba valley, although it was somewhat against my own judgment, since, from what I had seen then of the mountains, it appeared, that most of the steep scarps looked towards the south. For the ascent I took twenty of our Ujiji men, with Omari-kidogo and the Nyasa cook. I took enough preserved provisions of various sorts to last a fortnight, and about two and a half loads of rice. The men took two small patrol tents, and I had also my ordinary tent, six



SEMI-DIAGRAMMATIC VIEW OF THE NORTH END OF THE ALBERT NYANZA, SHOWING THE CONTINUATION OF THE RIFT ALONG THE SEMLIKI VALLEY, AND THE RELATION OF THE RUWENZORI MOUNTAINS.

Eastern edge of rift and part of Victoria Nyasa plain.

Ruwenzori range.

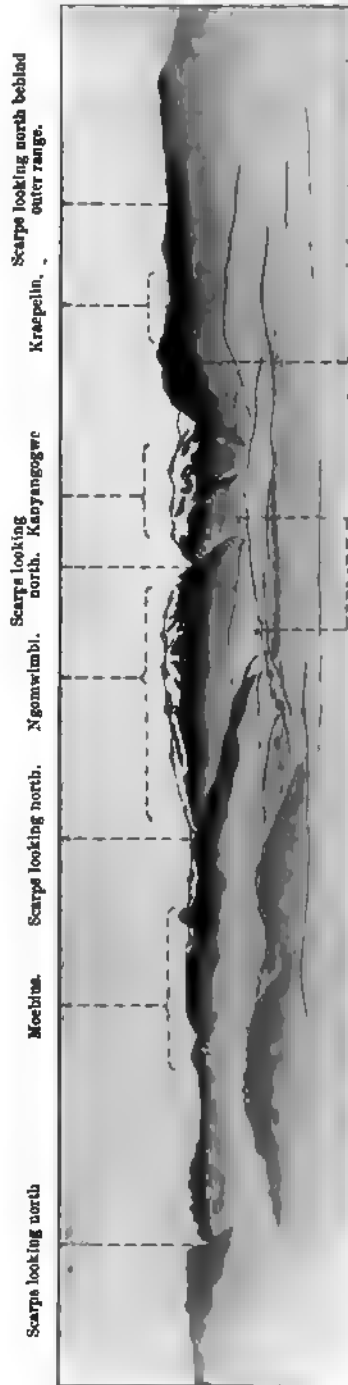
Semliki river.

Old lake Western wall of rift. deposit.

blankets, some flannel shirts, a tarpaulin jacket and hat, and a pair of indiarubber sea-boots. For the men's food, in case of emergency, I took three live goats and a sheep from Fort Gerry, and we bought five more on the road. It will thus be seen that the party was quite self-contained, and so long as we could get water we were quite prepared for a month or more. This, I believe, is the great secret of success in all attempts on high mountains where roads are not, and the party may be more than a week cutting their way through forests to a point at which to attempt an ascent. The morning on which I intended to have left Fort Gerry was beautifully cool and clear, but Mr. Bagge's boy now complained of fever, and as we were not sure whether he was shamming or not, I gave him a gramme of acid quinine in a tumbler of water, and told him I should repeat the dose at breakfast-time if he were not better, but long before this he said he could start. He seemed unable to walk, however, and I finally camped on the Katwe road, not 5 miles from the fort. During the night it rained heavily, and day broke in a wild thunderstorm, with torrents of rain; this delayed our start till 10 a.m., when we got out of the elephant-grass in a fine cold drizzle, leaving the road and striking south-west towards the mountains and the village of Butanuka. The track lay over very hilly country, covered with tall elephant-grass, through which we had to bore our way half a mile at a time. The breathless mid-day heat in these tall grass patches is fearful, but about eight o'clock it clouded over, and finally about four another deluge of rain came on. In the tall dripping grass we were wet through in an instant, and reached the village, which stands on an exposed hill, in a miserably drenched and cold condition. We were here at a height of 7000 feet, and the cold clear evening wind, blowing off the mountains after the rain, cut the porters like a knife. The village was in the possession of a genial old native lady, clad in a great bark cloth, and with ear-rings about 4 inches in diameter. She brought me dry firewood, eggs, and milk, for which I gave her cloth and beads.

Next morning we started south, along some grassy down-like spurs, towards the Wimi river, which about 9 a.m. we heard roaring in a deep valley. When we descended the deep dip to the river-bed, however, we found it a broad brown leaping torrent, grinding invisible rocks in its bed like millstones, and quite impassable. I was most anxious not to waste time, and by cutting our way through some very thick elephant-grass and scrub, we reached a clump of tall acacias on the north bank. I got the men to fell the largest of these, a tree about 80 feet in height, and let it fall across the stream, so that I could send a boy across on the branches with a rope. Big as it was, however, and only half cut through, when it bent gracefully over into the water the fierce current swept it away with a succession of sharp cracks, and it disappeared down the stream like a cork. I tried another, and yet

another, all with a like result. I therefore collected the men and decided to march round to the east, and to try the lower ford on the Katwe road, about 7 miles off, although Mr. Bagge's boy told me that after the heavy rain it would probably be worse. We reached the river again about 2 p.m., and as we approached the ford we found several natives waiting to get to the other side. Here fortunately, just above the ford, there are two rocks jutting out into the stream from either side, and by felling trees we reached one of these, and then threw poles across to the other. The river leapt between some 16 yards wide, in a swift cataract, and it was by no means pleasant watching the first man cross, for the poles could naturally not be fixed on the other side. By this means we finally got over the river, and camped just as the sun was setting upon the plain above the opposing bank. We were now once more back upon the dry grass plains of the Albert Edward Nyanza. The air was warm and limp, and full of mosquitoes, and away to the west, over the large flat bed of the Mobuko, which extended far into the hills, the great range rose in an endless succession of dark forest-clad spurs, up to the thunder-clouds above. The valley of the Wimi is several miles wide at the base of the hills, and thus continues the yellow plain in a great V-shaped indentation, which reaches up



VIEW OF RUWENZORI OVER THE PLAINS LOOKING WEST, FROM THE SOUTH BANKS OF THE WIMI RIVER.
(From a photograph.)

to the beginning of the higher slopes, the whole appearance of the range from this point being not unlike that of the Alps, looking north from Turin.

Next morning broke clear and cloudless, the grass about the tent was drenched with dew, and there at last, over the west just before the sun rose, hung the long line of snow-peaks, every crag and detail brilliant in the morning light. From where I stood, the whole range seemed to be formed of three more or less detached masses of peaks, which rose from the north and the south from each side of a central mass nearly opposite the camp. As the sun rose the details became clearer, and I noticed below the snow on the different peaks there was a curious orange band, which was evidently "the brown line of rocks" noticed by Stanley when he viewed the heights from the Semliki valley on the other side. The view from this point in the early morning was more beautiful than any I have ever seen. All round us lay the warm yellow plain covered with dry grass and pinkish sand, and forming a dull golden foreground to the deep purple forest of the nearer hills. Further away again rose the higher forests in tier upon tier of paling blue, and over these the white snow-fields, so lonely and clear and cold, that it appeared as if one suddenly looked altogether out of the sweltering barbarism of the tropics into another and totally different world. Besides its marvellous beauty, this extended view of the great range was of the utmost importance to me during the later portion of the ascent, as it gave me an opportunity of making a rapid sketch of the various peaks, thus fixing their relative positions, so that I was subsequently able to identify my position at various points on the way up. After a short march in the early morning we reached the Mobuko river, and to our consternation found it in flood, like the Wimi, only, if possible, more impassable still. We had thus lost one entire day, and seemed likely to lose another, in trying to get across these rivers to the place from which we originally intended to make a start. The Mobuko river, however, winds back itself into the mountains, and appeared to afford a good road by which to approach the higher portions of the range, and this approach has attracted the attention of other explorers, for I find that Mr. Scott Elliot remarks in his book that Captain Lugard had mentioned it to him as one of the best ways to reach the snow. I therefore determined to change our route and try this valley forthwith. Having called the men together, I struck straight across the dry plain towards the gap in the hill from which the river emerges. It was a hot, rough march, especially after we reached the foothills, the valley narrowing into the form of a wide flat-bottomed trough, floored by tall elephant-grass, spear-grass, thorn trees, and dense scrub, among which the beautiful scarlet Kaffir bloom was conspicuous all the way.

After a halt, I found the path along the floor of the valley so terribly

hot, buried as we were among the immense grass, that I struck out on to the steep hill on the north side with one boy, leaving the men to come more slowly along the flat; and while we were marching rather moodily along, as there was nothing to be seen of the mountains, he pulled me suddenly by the sleeve and whispered, "Tembo!" (elephants). They were close to us on the floor of the valley, plodding through the grass about 80 yards off. I had nothing with me but my Lee-Enfield sporting rifle and expanding bullets, so that it would have been useless to fire at them from the hillside. The herd moved slowly into a small open space, twenty-two in all, some very fine beasts among them, and rested a moment, waving their trunks, and flapping their great ears to keep away the flies. Then they began to trumpet, and moved off again, making a broad track through the scrub and grass. They now crossed the valley, and in a few minutes forded the river, disappearing among the grass and trees on the other side. Hardly had they gone when another herd of fourteen came slowly down the same track, stopped a moment in the same clear space, and, after trumpeting loudly, passed away in like manner across the river out of sight.

About an hour later we struck a path, and towards evening we came to a small village near the river, where the chief gave me a fat-tailed sheep, and accompanied us to a larger village just at the mouth of a great gorge, where the valley finally enters the higher range. We were all very tired, and I was extremely grateful to an ugly old man who brought a great bowl of fresh goat's milk to the tent. I think I must have drunk more than a gallon of it, and, after a bathe, went out to see where we were. Ascending a small spur, I found that directly in front of me the valley appeared to be almost closed by a huge tooth-like mountain rising above the forest in bare, black, absolutely perpendicular precipices to a height of about 12,000 feet, and a little to the south of this, and just visible between it and the southern shoulder of the valley, there was a solitary snow-peak, wild and jagged enough to raise doubts in the mind of any climber. It appeared to be about 4 miles to the west.

On the following morning we left the camp about 7 a.m. and pushed rapidly up the valley, crossing the still flooded and ice-cold river twice, until we rounded the shoulder on the southern side of the valley. Once round this, we entered the mountain region proper, ridge after ridge rose steeply to the north and immediately to our left, clothed with dense forest, from which protruded heavy masses of rock. Immediately in front of us, and entirely blocking the view up the valley, was a steep forest-clad spur, which we ascended, and after a very stiff climb of about 1000 feet came out on the top. On the narrow summit there was a sort of meadow, covered with soft grass and yellow and pink ground-orchids, and a few huts were grouped among the trees; and, coming almost immediately on the opposite face of the

ridge, we came also upon one of the most superb panoramic views of great mountains I have ever seen. The north-western face of the ridge on which we stood fell about 1500 feet sheer into the river, and commanded about 4 miles of its deep valley; and round this, forming as it were an immense natural amphitheatre, there rose some thirty huge mountain masses, which frowned down on the white foaming torrent in an absolutely bewildering array of solemn cloud-flecked precipices.

The natives in the little village on the ridge were a friendly primitive people, who bartered peas and beans eagerly for cloth. I made friends with the headman, and finally got him to go with me to the snow-line, together with fifteen of his men. This was a great score, as the mountain people are used to the cold, and, further, they know certain paths which lead up the mountains to some distance, and are used by them while trapping the hyrax, out of which they make their long fur coats.

As we lay talking to them, the chief told us that no one could get up to the snow, that beyond a certain height the mountains were full of devils, and that as the traveller approached the snow-line, the "white stuff" continually changed its place.

After extracting in this manner what trustworthy information I could from the people, I decided that the chief and ten men from the village should accompany us, while Marabu and five Swahilis remained in the camp. Next morning we started for the upper part of the valley, taking with us two loads of rice, my own provisions (one load), instruments, blankets, clothes, etc., and two very small tents belonging to the porters; one of these was for myself, and the other for the Swahilis, Omari, and the cook. We also drove up five goats and a sheep. The way taken led down a steep descent of about 1000 feet, into the bed of a southern tributary of the river, which we crossed, and then began to ascend along the great gorge of the river itself. The gradient was steep, but the bush and forest not thick, and after about three hours we rested on an overhanging rock perched on the edge of the gorge, which here fell some 1500 feet sheer into the torrent below. The forest became now more or less diversified with bamboos in patches, and soon after lunch we entered a very thick grove, beneath which the ground was black and boggy. After a time the boggiess of the ground became more and more pronounced, and we finally sank up to our knees among moss, ferns, and brambles, which straggled beneath the bamboos. To add to the general discomfort, clouds now gathered round us, the mist was damp and chilly, and finally rain fell in torrents. It was quite easy now to march in a coat with a tarpaulin jacket over that, and about three o'clock we reached another great overhanging mass of schist, under which we took shelter from the rain. Immediately beneath the rock the ground was dry and dusty for the space of about 3 feet. The men were shaking with cold, and we lighted fires and pipes, for

the temperature under the rock was only just 40°, and whenever the wind stirred among the tall wet bamboos, which shut us in like a fence, the half-naked Swahilis crowded round the blaze miserably. The natives of the mountain village were much hardier, but all appeared to be wretchedly cold and wet. About 3.30 p.m. the rain cleared, and I should have liked to have gone on, but all the men declared that they had more than enough of it for one day, so I let them stay where they were, and formed an early camp.

It was a curious place, completely shut in among the tall drenched bamboos, and from which no view was possible. I therefore climbed round the rock, and finally got out on the top of it, where I could see



THE BAMBOO ZONE ON THE RUWENZORI RANGE, AT ABOUT 10,000 FEET.

the great thunder-clouds slowly rising off the dark green slopes that surrounded the valley, disclosing the deep purple sides of the central mass, towards which we were making. As they lifted, some brilliant streaks of snow appeared above the forests of the central peak, and I was again wretchedly misled, as I found out afterwards, by our apparent proximity to this ridge, which rose immediately in front. Light wreaths of mists and finer blue vapour lay about the valley and the forest-clad slopes, in the same way that they do at home on a wet October evening, and the air felt similarly frosty and cold and damp. As the thunder-clouds dispersed, one could make out more of the surrounding heights. There was a wild rocky tooth over the forest to the left, so sharp and steep that neither trees nor snow lay upon its savage summit, which

must have reached a height of 15,000 feet. This tooth-like spike, and the great mountain masses which lay to the south of it, were separated from the central mass, which now lay immediately in front of us, by a deep cleft, running east and west, the bottom of which seemed to lie on about the same level as the rock on which we stood, while to the north of the central mass there was another cleft separating it from the northern snowy summits. This was not so deep, and both clefts or passes terminated towards us in a sort of expanded meadow 2 or 3 miles long and about 3 miles broad, covered with moss, heath, and bushes, and lying immediately in front of us.

We had thus a choice of two paths, one to the north and one to the south of the central peak, and as the sun set I held a consultation with the old chief as to which would be the best road to take. We finally decided for that to the north, as it appeared to be higher, and returned to the shelter of the rock. Next morning I awoke cold and stiff in spite of the blankets, and set off towards the meadow. We dipped slightly down, and the ground became more and more boggy as we went, small streams trickling between the moss and bramble roots, and the hollow places being filled up with masses of cold wet sphagnum, often very deep. On the brambles were delicious blackberries, and among the thorns there now appeared numerous heath trees, often 60 feet or more in height. The meadow was also flooded with warm sunshine, and ablaze with many kinds of brilliant flowers. After blundering through this bog for about two hours, we at last reached the foot of the central mass, which rose abruptly from the meadow in great brownish precipices of micaceous schist, unscalable in most places, and carrying high up on its wild face, in cracks and ledges, patches of dark heath and red and green thorns. To the north, however, at the base of the cleft between the central mountain and those to the north, which we had seen from our last camp, we found the course of an old torrent which had at some former time swept down into the meadow under an immense overhanging face of gneiss. The course of this torrent was now dry, and we found it possible to ascend, creeping under the great cliff, which hung over the channel for more than 50 feet. The channel was dry and dusty, and so exceedingly steep that it was with the greatest difficulty that the loads were got up at all, and finally the sheep had to be pulled up neck and crop with a rope. I was determined, however, that everything should go up, as I felt sure that the snow was further to the west than we had supposed. Beyond the first pitch of this ascent it was necessary to traverse out along the face of the cliff a short distance to the north, and here we crossed probably the same stream which had at some former time made the channel below. Beyond this the final climb into the base of the upper valley was very wet and steep, and finally we got out on to the flat ground which forms the base of the cleft we had seen the night before. We were now completely in the heath zone; the

bamboos had disappeared, and the whole of this upper region was clothed in a dense forest of moss-draped heath trees, between which there were patches of yellow sphagnum and other kinds of different-coloured moss. The great trunks and branches of these trees lay as they had fallen for centuries, this way and that. Some rotten, some sound, and piled up for 30 or 40 feet above the actual ground below. Betwixt and between their sharp twisted limbs moss of every kind had grown, filling all up into what looked like a long-forgotten graveyard while the dark surrounding heath forest, which still stood with its black foliage and long grey waving moss beards, added materially to the unearthly appearance of the scene. It was a terrible place, for every step had to be taken at random among the moss and rotten stems, and men and loads were continually disappearing with a yell and a crash. I was doubtful what to do, for it was impossible that we could push far through the valley if it remained the same; but fortunately the men seemed to think that I should go on at any price, and finally we came to better and steeper ground.

The ascent now followed the river we had crossed in the morning, and to walk along its stony path free from the terrible heath was a relief indeed. After a time we climbed out of the valley along the southern slope, and the men were evidently getting very tired, as the chief was continually pointing out white blocks of quartz on the different slopes as snow, knowing that snow was what I wished to reach. I had no idea where we were, for all above was draped in heavy mist, and finally the chief came to me and said that we had better turn up at once and ascend the slope we were on. I had doubts about this, however, as I did not think we had travelled far enough to the west. But, fortunately, while we talked the clouds parted ahead, and right in front of us there appeared dimly the huge form of a snow-peak. I therefore descended rapidly to the floor of the valley, and, following it up, came to another steep step, up which the men climbed slowly and with difficulty, and finally one of the Swahilis said he could go



INGOMWIMI, ONE OF THE HIGH PEAKS ON THE RUWENZORI RANGE.

no more. I gave him brandy, and told him to rest where he was for a time, Omari carrying his load. We then got over the step into the other part of the valley, and a few hundred yards further on found shelter and a camping-ground under an immense overhanging cliff of schist. The sun was now setting far below, sending a wild red glare over the clouds, which had again descended on the peak. There was plenty of firewood, and we tried to keep warm, for the thermometer stood at 30° , and, in spite of all we could do, it was bitterly cold. Just before the sun disappeared, the clouds rolled away and disclosed a splendid pink snow-peak just in front of us, the summit of which appeared to be about 2 miles away and some 2000 feet above where we stood. This peak eventually turned out to be Ingomwimbi, and I obtained a photograph of it, given on p. 29. Later on the moon rose, and the view of the crest of the mountain grew again brilliantly clear, the dark crags and snow-patches glittering in the blue frosty light.

I awoke next morning very stiff and cold, and proceeded to awake the cook, who was quite naked, and snoring loudly by a red fire. We made a large breakfast of the sheep we had killed the night before and a goat, to which I added sausages, jam, and delicious water from the river, and then started once more along the valley. The morning was cloudless, and the early sunshine was pleasantly warm, as we passed from the deep cold shadow of the rocks. After proceeding for a considerable distance up the valley, the nearer ridge of Ingomwimbi shut out the snow-fields from our view immediately in front, and we found another step in the valley 400 or 500 feet in height. Going, however, was now easy among the moss and strange gigantic tree lobelias. The vegetation was becoming thin, and there were no more doubtful places to be crossed. Omari was some distance ahead of me with Mr. Bagge's boy, and when they reached the top of the step together, I saw them calling to me to come up and look. When I reached them, I found we had come suddenly upon a most surprising view. The valley swept round the face of Ingomwimbi to the right, and steeply enclosing this extension on all sides rose the huge buttresses of the snow-ridge itself in a great horse-shoe, dazzlingly white and beautiful, and throwing off three superbly green glaciers which descended into the valley.

After contemplating the glorious snow for some time, I tried to determine where we now were, and what would be the best way to get up on to the ridge itself. It was obvious now that Ingomwimbi and the ridge facing us were both really part of the same mountain mass, and, moreover, formed what had appeared to be the upper snows on the great central snow-fields when viewed from the plains below, although there were now visible patches of snow below us on the lower central ridges. To the right there was a great cleft filled by a glacier,

and further again rose another high snow-peak, which was unquestionably part of the northern snow-fields which we had previously seen. That part of Ingomwimbi which we had seen first from the camp the night before formed an angle with the ridge which now faced us, and in the angle the smallest of the three glaciers fell, while further along the ridge a much larger mass of ice descended towards the valley, giving off a stream which fell in a beautiful cascade into the valley itself. By carefully examining the face of the ridge in front, I came to the conclusion that it would be impossible to ascend by the glacier on the right, nor yet by the small glacier on the left; but it appeared that there was a practicable ascent towards



THE NORTHERN SNOW-RIDGE OF INGOMWIMBI, FROM A POINT ABOUT 12,500 FEET

the great central glacier, by first moving up to the left, then crossing the base of the glacier itself, and afterwards working along a rocky ridge, first to the right and then to the left on to the top of the ridge.

I had thus two courses now open to me—I could either ascend at once to the left, and attempt, by working back along the valley, to get out on the top of Ingomwimbi, or go up the valley a little and try the visible ascent by the glacier, on to that part of the same ridge in front, which the natives call Sichwe. I wanted to visit the glaciers, and I decided for the latter. We therefore moved on nearly to the end of the valley, and thence struck up the steep slope to

the left. Here, after a short time, we got into difficulties, and had to work round some precipitous gullies; finally, however, we got above the bad place, and climbed steadily on till we reached the moraine of the little glacier to the left, which we crossed, moving out towards the top of the cascade, which came from the great glacier itself.

We were now almost clear of all vegetation except moss, and I moved as rapidly as possible towards the waterfall, for clouds had gathered on the snow-fields above, and this part of the ascent might become hazardous if we missed the way. We had hardly got within 200 yards of the water, however, and were moving along over an awkward rock-face, when, without any warning, the mist rushed down upon us, and for some time we were in a very unpleasant situation indeed. It was intensely cold, fine snow was falling, and we were struggling along the smooth ice-worn edge of a fearful precipice that sank into the valley 1600 feet below.

The roar of the waterfall was deafening, and I found it also most unnerving in the white impenetrable shroud in which we were now enveloped. I therefore struck up towards the glacier without crossing the stream, telling the men to follow, which they did. We were now slowly scrambling up over wet rocks and patches of snow. The men were shivering, and I was afraid the Swahilis might die; but the clouds sank suddenly below us, and a flood of warm sunshine showed the bluish caverned base of the glacier about 100 yards in front. I halted at the edge of the ice, and called to the men to come and eat some. The Swahilis would not touch it for some time, but after I had eaten some, tried also, grinning with the fierce cold. One boy picked up a large piece, wrapping it in his cloth with the intention of taking it back with him to Ujiji. The ice lay in huge blocks, which had fallen from the face of the glacier, all round us, and, while we were there, ice and stones came thundering down in showers as the warm sun played on the fields above.

From where we stood it looked possible to ascend along the north end of the glacier, but while I was debating with myself whether to follow this route or follow out the longer one to the right, a sudden squall came on; the wind rushed down off the ice filled with fine driven snow, causing a general stampede among the half-naked men. They ran down the steep rocks nearly to the top of the cascade, where they crossed the stream, and finally took shelter under some huge rocks where there was a quantity of moss and dead herbage. With these we lighted fires, and I put up what shelters I could with stones and moss, the Ujiji boys being far too cold to do anything for themselves. It was now about 11 o'clock, and I left the camp, striking up across the rocks towards the point I had seen from the valley below. As I crossed the snow-patches of the slope above, there was a glorious view of the

snow-peak to the north. It is very high and precipitous, and on the west drops into the Semliki valley in a succession of fearful precipices, on which, near the top, huge masses of snow were hanging as if by a single hair, until they should finally topple over, as others had done, into the green valley thousands of feet beneath, each leaving a great blue rent in the white treacherous slope above. Hundreds of glittering white heaps of snow had also fallen from this peak upon the small glacier to the north, now far below us.

Looking towards the south-west as I neared the final ridge, the view



THE BROAD GLACIER ON THE NORTHERN SNOW-RIDGE OF INGOMWIMBI, FROM A POINT ABOUT 13,400 FEET.

remained completely shut in by the dark precipices of Ingomwimbi, and advancing further, I came upon a stratified mass of ice and snow 200 feet in height, and which lay against some rocks to the south. The face of this cap was brittle and bad, so that I finally worked up on a quantity of freshly fallen snow, which completely filled the angle between the ice and the rocks. It was a very steep and awkward ascent, and I should say almost impracticable to one man, unless much fresh snow filled the irregularities of the ice and rock. In several places I had to take alternately to the rock and then to the ice. But at last the rock became better, and I finally got out on to a small patch of snow under a mass of rocks that stood about 10 feet above me on the left. It was the top of the ridge, but there was nothing else to be seen. The snow

sloped gradually away to the west and on both sides of me, while a furious cold wind and mist came rushing from the Semliki side. I set my aneroid, and descended slowly again into the lower snows. I found the way down anything but pleasant. My hands were numb with the cold, and the superficial wetness of the snow and rock had now frozen into an intensely slippery glaze, and I had several unpleasant foretastes of being shot over the edge of the ice-cap on to the lower snows. Finally, however, I got down, and found my way into the camp just after sunset. Omari and Mr. Bagge's boy, however, were not there, and I found that they had gone out to look for me, alarmed at my long absence on the ridge.

3. It will have been seen, from the foregoing description, that the existence of an extensive high plateau in the centre of the range must be dismissed as a myth. The Moboko valley and several of its branches run completely through the range, forming in the west between the high snow-peaks passes, which are known to the natives, and by which they say they have crossed into the Semliki valley on the other side. Broadly speaking, the whole range is composed of three more or less disjointed masses. There is a great central mass of wild and very lofty mountains, at least four of the peaks of which are snow-capped, while on the north and south of it there are deep valleys, which are again bounded by the white snow-peaks to the north and south. So far as I could tell, this central portion seemed to be the highest.

The peaks to the north contain what have been termed Kræpelin and Saddle mountain and Kanyangugwe, while those to the south are Moebius and the snow-ridges south of it. The central mass is undoubtedly the mountain known as Ingomwimbi, and it was the northern snow-ridge of this which I ascended.

Three of the valleys between the central and northern peaks contain glaciers, and the Muboko itself rises in the great glacier, a photograph of which appears on p. 33, and which faces the upper part of the valley. The valleys between the three sets of peaks cut in a south-west and north-easterly direction, and, beginning in the south, the range rises in a succession of long slopes, which culminate in a number of snowy ridges, that end northward abruptly in a terrific series of scarps between the southern and central peaks. In like manner the central masses rise from the south and terminate that way in the gigantic precipices of Ingomwimbi, which are seen in the photographs on p. 29.

Still further, the peaks to the north rise from the upper part of the Muboko valley in a succession of very steep rock-faces, the schists being tilted at an angle of 60° , and in like manner these slopes terminate towards the north in abrupt precipitous faces. Mr. Scott Elliot, who added much to our knowledge of the botany of these mountains, does not appear to have visited the northern extremities of the range, and

this, I believe, led him to the view stated in his book concerning its formation, where we find the whole series of mountains represented in a diagram, which is exactly like a felled tree-stump, wherein the bark represents the uptilted schists, and the protruding inner tissues the elevated snowy plateau, which, according to his map, apparently exists. In reality, as we have seen, the mountains are formed by a succession of ridges with deep valleys in between them, which ridges have been tilted up and faulted in such a manner that their broken scarps look more or less towards the north. The tree-stump theory of the nature and origin of the range, which Mr. Scott Elliot publishes in his book 'A Naturalist in Mid-Africa,' is, however, curiously inconsistent with the combined paper by himself and Dr. Gregory, published shortly before in the *Journal* of the Geological Society. This paper is very short and very concise, and I may say at once that I totally disagree with each of the main statements contained in it. Thus where the joint authors say that Ruwenzori is "a mountain" between the Albert Edward and Albert Nyanzas, we have seen that there is not "a mountain," but a long range of mountains separated by deep valleys; and this range, instead of extending for some 50 miles, as the joint authors state, is between 70 and 80 miles in length. Further, instead of being a narrow ridge, as stated in this geological paper, the range is rather a parallel series of ridges which occupy a considerable breadth, its broadness in comparison to its length being rather a feature of the whole range, as in fact Mr. Scott Elliot shows in his own map. Further, the joint authors say, without comment, that the highest peak is 16,500 feet in height. On what authority this statement rests, it is impossible to say. So far as I know, it is as yet quite impossible to say which of the numerous snowy peaks in the range is the highest, much less give its exact height; and, lastly, I am utterly at a loss to comprehend the origin of the statement in their paper, that the eastern slope of the mountains is only 4° . In all cases where I observed the general slope of the eastern face, it was something over 40° .

Before the reading of the paper, the PRESIDENT said: We have the pleasure of welcoming Mr. Moore, who has visited the great lakes for purposes partly geographical, partly biological; his investigations he will explain to you, and they are of great interest. He has never read a paper here before, but one of his communications respecting his first journey was printed in the *Journal*.

After the reading of the paper, Prof. RAY LANKESTER said: I think you will all agree with me that the Tanganyika Exploration Committee, as we termed it, has reason to be highly gratified with the results that have been brought home by our friend Mr. J. S. Moore. The origin of his visit to Tanganyika in the first instance was a suggestion made to me by Dr. Sclater, whom I see sitting here, in the year 1896, that, as it is now so easy to reach Tanganyika, and there are Europeans residing by the lake, it is a pity that some young English naturalist should not go

there and look into the question of its jelly-fish and other possible marine organisms. I searched about for some one who had the courage and the capacity to go there alone and spend some time on the lake. After a time Mr. Moore came forward and volunteered to go. He had no experience of travel at that time, but he has proved a most capable man in African work. I then obtained a small grant from the Royal Society and one or two other sources, and Mr. Moore also spent some of his own money on his first expedition. He stayed seven or eight months in 1897 on the shores of Lake Tanganyika, and brought home the interesting results of which he has told you. It then occurred to me that a more extended expedition might lead to more important results, and that we might get some geological evidence as to the previous history of Tanganyika, and the whole of this question of the northward extension of the lake, its possible connection with the Nile valley or the Red sea, if Mr. Moore was willing to go again; so we formed this Tanganyika Exploration Committee, and obtained very great help from a number of gentlemen interested in Africa. I hope and believe some are here present this evening—Mr. Alfred Beit, Mr. Astor, and various other individuals connected with Africa or interested in science. So Mr. Moore was enabled to go again, taking with him this time Mr. Fergusson, a competent surveyor and geologist. Well, I must confess myself that I was disappointed that the party was not able to spend a longer time on Tanganyika itself. We had hoped this would be the case, but a very good reason existed for more rapid movements to the northward. The Germans in Ujiji were willing to help Mr. Moore in extending his journey from Tanganyika to Kivu, and we wished to know—that was a point of the scheme—whether the Albert Edward and Kivu contained the same marine fauna as Tanganyika. He had to take the opportunity which the Germans gave him; if he had waited another six or nine months, as some of us wished, he probably would never have got assistance from the Germans—that we know from other sources. So his stay on Tanganyika was cut short. However, he has added further to our knowledge of the fauna of the Tanganyika waters, and obtained what we must call somewhat negative results on the question of its extension northward. The clue he followed up proved to be negative. He has shown that Tanganyika did not extend northward; on the contrary, he is certain that the marine connection must have been a southward one and westward, probably through the great Congo plain. Having gone northward, it was impossible for him to return to further examine the region to the south-west of Tanganyika. In that region we hope at some future time to find geological indications and other evidence of the marine connection. Of course negative evidence is important; it has its distinct importance and value as much as positive evidence, and we are in a position to say certainly that the marine fauna of which Mr. Moore has so fully established the existence in Tanganyika, did not arise from a northward extension of the lake. The beautiful photographs and other facts, and the various observations made in obtaining surveying data are all, I think, exceedingly interesting, and I am sure you will all agree with me that Mr. Moore's expedition has been a very important and valuable contribution to our knowledge of this part of Africa, and to zoological and geological science.

Mr. BOULENGER: I cannot adequately express my pleasure at having been able to work out the collection of fishes made by Mr. Moore. When we come to think that, although the lake was discovered in 1858, the first fish were described by Dr. Günther in 1893, it seems wonderful how long a time we knew absolutely nothing of its piscine inhabitants. On this present expedition Mr. Moore succeeded in getting twenty-three new species and two new genera, and it seems an extraordinary thing to find that we have nearly as many species known in Tanganyika as from the whole Nile. Although only three years ago we knew only six fishes

in Tanganyika, we now can list ninety, and it has been my privilege, owing to the exertions of Mr. Moore and also of the Belgian officers of the Congo Free State, to describe seventy-two as new species, of which seventeen are types of new genera. I can, therefore, only thank Mr. Moore most cordially for all he has done to enrich our knowledge of Lake Tanganyika's ichthiology.

The PRESIDENT: I quite agree with Prof. Ray Lankester that Mr. Moore has added considerably to our knowledge of this part of Africa, and I think the meeting will also agree with us. I dare say it will be within the memory of many of us that Prof. Gregory six years ago described very carefully that long rift which he traced from the Lebanon, the valley of the Jordan and the Dead sea, down the Gulf of Akaba and Red Sea, and across the line of these lakes. He was repeating what had already been said by Suess, and he was the first who brought to our notice the existence of that extraordinary rift or valley, far longer than anything else that exists in this world, extending, as he supposed, from the Lebanon almost down to the Cape. Mr. Moore has added to this generalization a much more minute and clear description of a certain part of the rift. He has described to us, with the help of these beautiful photographs, that marvellous volcanic region north of Kivu, and shown us how Kivu, once in the valley of the Nile, has been turned by this overflow of lava and forced to send its waters to the Tanganyika. He also, I believe, is inclined to look to the valley of the Congo and to the westward, instead of to the north, for an explanation of the marine fauna found in Tanganyika. All these points are extremely interesting, and Mr. Moore has brought them before us in a most graphic way. His paper is an admirable geographical paper, and I am sure you will all wish to pass a very unanimous vote of thanks to Mr. Moore for the very agreeable and interesting evening he has given us, both by his descriptions and by the way he has delivered his account of these regions, and the beautiful photographs with which he has illustrated what he had to say. I beg to propose a vote of thanks.

APPENDIX.

METHODS USED IN SURVEYING, AND GENERAL NOTES.

By MALCOLM FERGUSON.

It may be of interest to some to hear how the observations were taken and the route surveyed during our travels through the Lake Region of Central Africa. The principal instruments lent by the Geographical Society were the following: 1 transit theodolite, 6"; 1 sextant, 8", and artificial horizon; 2 aneroid barometers; 3 watches; 1 prismatic compass; hypsometrical apparatus.

On arrival at Blantyre I was enabled through the kindness of Sir David Gill, Astronomer Royal at the Cape, to have the time transmitted by telegraph. Sir David also arranged to wire again to the telegraph terminus near Abercorn, but owing to a breakdown this was impossible. However, I was able to correct them at Nkata bay on Nyasa and Kituta at the south end of Tanganyika, which points had been determined by telegraph from Capetown and triangulation by the Anglo-German Boundary Commission under Captains Close and Boileau.

The positions which I determined on Lake Tanganyika were the results of astronomical observations, and I was able to check most of these three times, over considerable intervals of time, as we journeyed up and down the lake, so there should be very little error in the longitudes. With the transit theodolite I was able to take latitudes by stars, face right and face left, and in no case was there a difference of 5" between the two observations.

Since arriving home I have received a letter from a German traveller, Dr. Kohlschutter, who was conducting an expedition for the determination of the force of gravity and also surveying. He sent me the results of his observations for Ujiji, which I find differs only half a mile from mine. His work should be good, as he had eleven watches and a pendulum clock. His position is long. E. $29^{\circ} 42' 38''$. Whilst mine, corrected for distance apart of points of observation, is long. E. $29^{\circ} 42' 0''$. This is most satisfactory, as I am sure of my relative positions on the lake being correct.

The journey between Usambura on Lake Tanganyika and Changuu on Lake Kivu only occupied seven days, so that any error due to change of rate in the watches would be very small in this time, and as we traversed the lake and returned to this point before proceeding up again, I was able to check everything here again. The country between Tanganyika and Kivu I surveyed with prismatic compass, pacing and latitudes. The first 25 miles of this is a broad fertile alluvial plain closed in east and west by the great parallel ranges continuing from the shores of Tanganyika, and north by spurs coming down east and west from those ranges. After that it is hilly country for about 25 miles, changing very little in altitude till the German station of Butagata is reached, when a sudden rise of 2300 feet is experienced. From the top of this range both Kivu and Tanganyika can be seen on a clear day.

Kivu itself lies in a basin, being shut in by precipitous hills all round except at the north end, which is dammed up by the lava beds from Kirunga. I think it quite probable that Kivu was once only a river running down to Lake Albert Edward, then the great volcanic eruptions occurred and dammed up the outlet at the north, so that it rose till it found an outlet south through the mountains by the Rusisi into Tanganyika. The natives call Kivu, "the river."

The Rusisi at its exit from Kivu is only about 60 feet wide, and rushes foaming through this narrow mountain gorge at a terrific speed. The scenery is beautiful, a few trees lining the banks of the river, whilst on the hills around there is not a tree of any description.

Squalls are of frequent occurrence, and often blow everything away, making canoeing extremely dangerous sometimes. The natives are rather a poor type, often tall, and nearly always slender and thin. The chiefs generally are much lighter in colour than the ordinary native, being sometimes quite copper-coloured. As a rule, they wear nothing except a goatskin round the loins, which they take off and put over their heads if it rains. They have a great objection to getting their heads wet.

From here northwards the natives get worse and worse, and, I should think, are the lowest possible type of humanity. They are a lazy, dirty, thieving lot of rogues, having no idea beyond cutting a stranger's throat. They cook no food, subsisting principally on raw peas, beans, and bananas, which grow in abundance here. If we shot any game, and gave them what we didn't want, they would fall on it like a pack of wolves, fighting and shouting, tearing off flesh and cramming it into their mouths till it was all gone, finally licking up the blood from the ground.

Around Kirunga, in spite of an enormous rainfall, there is no water, owing to the porosity of the lava, so instead of making reservoirs, the natives tap the banana stems when they want a drink, and let it run into a gourd. Washing is unknown. On the Albert Edward they are a little better, having come in contact with Belgian and English officers occasionally, but they are very lazy, cultivating nothing or very little. The lake swarms with pelicans, which swim about and pick the eyes out of fish; the fish then come to the surface, and the natives spend their days floating about in canoes or on logs waiting to pick up these mutilated fish.

The country from Kivu to Albert Edward I surveyed by latitudes, bearings, and time marches. There are so many conspicuous points along this route that plenty of bearings can be taken from each point. From Kirunga the valley slopes gradually down to Albert Edward. It was once thickly covered with forest, but now is laid bare in many places by rivers of lava, which extend nearly to the Albert Edward. This lava is so sharp and spiky it is impossible for natives to cross, so we had to march along the foothills of the eastern range till we got beyond the lava, then descended into the valley, whose scorching sandy plains teem with game and seem to grow nothing but euphorbias. We crossed the Ruchuru, and arrived at Vitchumbi, whose position I determined by astronomical observations. From here we proceeded up the western shore of the lake in canoes, surveying by bearings and time, then along the north coast to Katwe Fort George, where I was prostrated with a bad attack of fever, and had to be carried out to Toro.

In concluding, I must express my deep gratitude to all the European residents of these countries for their kind help and hospitality, especially to Captain Bethe and the other German officers on Tanganyika and Kivu, who lent us canoes for the traverse of the latter lake and entertained us during our stay, and to Mr. Bagge, officer commanding Toro, who nursed me through my fever and a month's convalescence at his headquarters of Fort Gerry.

SIR HARRY JOHNSTON'S RECENT JOURNEYS IN THE UGANDA PROTECTORATE.

WE have received the following information regarding the recent journeys of Sir Harry Johnston in the western part of the Uganda Protectorate.

Sir H. Johnston left Entebbe, the administrative capital of Uganda, on the Victoria Nyanza, at the end of May. He travelled through the Toru and Ankole districts for the purpose of making political arrangements with the chiefs. In the month of July, Sir H. Johnston and party crossed the Semliki river and entered the Congo Free State for the purpose of transacting some business with the Congo Free State officials. The opportunity was taken during this journey to restore to their homes in the Congo forest a number of Pygmies, who had been kidnapped by a German adventurer for the purpose of being sent to the Paris Exhibition. It had been sought to convey these Pygmies through the British Protectorate of Uganda into German territory; but, the Congo Free State officials having protested, Sir H. Johnston had arrested the German, and released the Pygmies from his control. These interesting little people were duly reinstated in their homes, if the term "home" can be applied to the tiny huts of leaves and branches which they frequent for a certain period in the great forest. By the courtesy and assistance of the Belgian authorities, Sir H. Johnston was enabled to visit these little people in their homes. He succeeded in making very interesting natural history collections in that part of the Congo forest which stretches from the basin of the Ituri river to the vicinity of the Semliki. Many photographs were taken of the dwarfs, male and female, of their

dances, implements, and dwellings. Anthropological measurements were also made by Mr. Doggett, the collector accompanying the Special Commissioner's expedition. Other Dwarfs were subsequently examined from the Mboga district, which is that outlying portion of the Uganda Protectorate to the north-west of the Semliki river. It was found that (as other travellers relate) the Dwarfs were of two types—black-skinned, with a good deal of stiff, curling black hair about the body, and red- or yellow-skinned, with a tendency to redness in the hair of the head and yellowish-grey in the hair growing on the body. Some of the Dwarfs, especially when young, had quite hairy bodies, and the women not infrequently had incipient whiskers. Sir H. Johnston arrived at the conclusion that these Congo Dwarfs no longer speak an original language of their own, but talk in a slightly corrupted form the language of the taller Negroes, in whose vicinity they dwell. All the Dwarfs examined by him spoke either the Mbuba or the Kibira language. The Kibira is a very debased form of Bantu speech, which is widely spoken by the forest tribes from near the Semliki river to the vicinity of the Congo. The Mbuba language, on the other hand, is not Bantu, but approximates more to the Sudan languages spoken to the north of the Bantu language field. But in speaking either language, the Dwarfs introduce curious “hiatuses” into their pronunciation, which bear a strong resemblance to the clicks in Bushman and Hottentot. They also speak in a curious and very marked sing-song. Amongst physical features which specially distinguish them from their neighbours is the large size and flatness of the nose. This organ has scarcely any bridge, and the wings of the nose are very large. The Dwarfs also have a very long upper lip, which is scarcely, if at all, everted. In many other points they exhibit ape-like features; but their intelligence is as a rule well developed, and though hideously ugly and often very ape-like in appearance, they are usually of a winning and cheerful disposition, while their dances are so frolicsome and gay and full of pretty movements, as to distinguish them markedly in that respect from the average negro. They also have a good idea of singing, and form themselves into little companies of minstrels, bearing a far-off resemblance to those of St. James's Hall. In these performances they generally prefer to remain seated, and in this position they dance with their arms and legs and backs and stomachs in the drollest fashion, singing loudly at the same time chants of a more or less pleasing nature.

Sir H. Johnston ascertained that there exists in these Congo forests a most remarkable species of horse or zebra. This animal is a uniform iron-grey over the upper part of the body. The belly and legs are striped on white with black or chestnut-coloured stripes. The head of this animal is said to be rather long and slender. Sir H. Johnston was only able to secure portions of imperfect skins, but such as they are they point conclusively to an animal of the horse tribe not hitherto

known or described. The Dwarfs call this creature O'api, with a click in the middle of the word, but the Bambuba style it Okapi. Rumours of this creature reached Stanley, and are recorded by him in one of the appendices of his book 'In Darkest Africa.' The Belgian authorities who gave Sir H. Johnston the portions of skin above alluded to, promised to try and secure a complete specimen of the animal for transmission to Europe. According to Sir H. Johnston, it is clear that the gorilla, as well as the chimpanzee, exists in these Congo forests between the Ituri and the Aruwimi. Photographs of dead apes which were shown to him were emphatically photographs of adult gorillas. Sir H. Johnston hopes to send home a specimen of the chimpanzee which is found in the western part of the Uganda Protectorate.

During the journey through Ankole, opportunities were taken to photograph the really interesting Bahima race who form a cattle-keeping aristocracy in that country. There is no question as to the Somali or Galla origin of these people, but they must be remains of a relatively ancient invasion of Bantu Africa. The dialects they speak at the present day are simply the Bantu languages around them. No trace whatever is found in their speech of any words of non-Bantu origin. In the case of the men, the hair of the head often approximates a good deal to the wool of the negro, but in some of the women of more or less pure descent, the hair is long, bushy, and frizzy, like the mops of the Hadendowa and other Hammitic races of the Nile. Some of the Bahima bear a most remarkable facial resemblance to the ancient Egyptian type.

When political business was settled, Sir H. Johnston had not much time left over to devote to the ascent of Mount Ruwenzori; but in the three weeks which he spent in examining the upper parts of the mountain, he and two of his companions ascended to a higher point, seemingly, than has yet been reached by any explorer. Sir H. Johnston is of opinion that Mr. J. Moore is under a misapprehension as to the altitude which he reached in his ten days' trip to the mountain. The natives indicated the point to which Mr. Moore ascended, and upon the altitude being taken it was found to be not much above 13,000 feet. All the native guides were emphatic in their assertion that no European had hitherto reached to a higher point. This is scarcely to be wondered at, seeing that above this altitude the difficulties of the ascent become so great that the rope or the ice-axe have to be in constant requisition. Sir H. Johnston and his two companions reached an altitude of 14,800 feet in their attempt to approach the highest peak of Ruwenzori. Beyond this they found a succession of sheer walls of rock, the ascent of which was extremely difficult. The weather at the time of their ascent was so bad that further progress in this direction had to be abandoned, as the snowstorms which assailed the party, together with the icy wind, so affected the health of the native porters or guides that

they were temporarily disabled. Turning in a somewhat different direction, however, by means of ropes the largest glacier was ascended for 500 feet, and a series of photographs was taken of the ice-caverns and crevasses. The lowest point of the largest glacier on Ruwenzori, on the eastern side of the mountain, is 13,200 feet in altitude. Snow was found lying as low as 13,000 feet, and permanent snow was reached at 13,500 feet. A large botanical collection was made, and photographs were taken of the more remarkable forms of vegetation, which include two species of giant lobelia, a tree-heath growing to 50 feet, and the tree groundsel, which was discovered by Sir H. Johnston in 1884 on the upper parts of Kilimanjaro. Collections in zoology made on the mountain in this vicinity will probably result in at least one new species of monkey, a new hyrax, a new antelope, and a number of birds, reptiles, and insects new to science.

The Bantu dialects spoken by the natives of the upper parts of Ruwenzori and in the adjacent forests, were found to be of the greatest interest as throwing light on the origin of the Bantu languages.

Sir H. Johnston, after a further term of residence in the kingdom of Uganda, will proceed at the beginning of next year to visit the northern and eastern parts of the Protectorate.

A JOURNEY FROM FORT JAMESON TO THE KAFUE RIVER.*

By C. P. CHESNAYE.

ACCORDING to instructions received, I left Fort Jameson on May 3, 1900, accompanied by Mr. M. Holland, of the Tanganyika Concessions Company, and Mr. Lyons, Assistant Collector, who was at the time under instructions to proceed to take charge of the Luapula District. Crossing the Loangwa Valley, we arrived on May 10 at the foot of the Machinga Range. A stiff and difficult ascent brought us to Hoste's Camp, the former head-quarters of the Rhodesian Concession Company, and apparently the highest point of this portion of the range, being approximately about 5000 feet above sea-level. Here a beautiful panorama spread itself; to the north the country is undulating and covered with belts of thick bush, with broken granite kopjes showing themselves here and there above the trees, and to the south, east, and west the valley of the Loangwa, with the Angoni plateau as a background, could be followed for an immense distance.

We reached Serenje, the present Administrative post for the West Loanga district, on May 12. This station, in charge of Mr. Kennelly, is built on a spur, horseshoe in shape, and commands the country on

* Report to Mr. Codrington, Deputy Administrator, Northern Rhodesia.

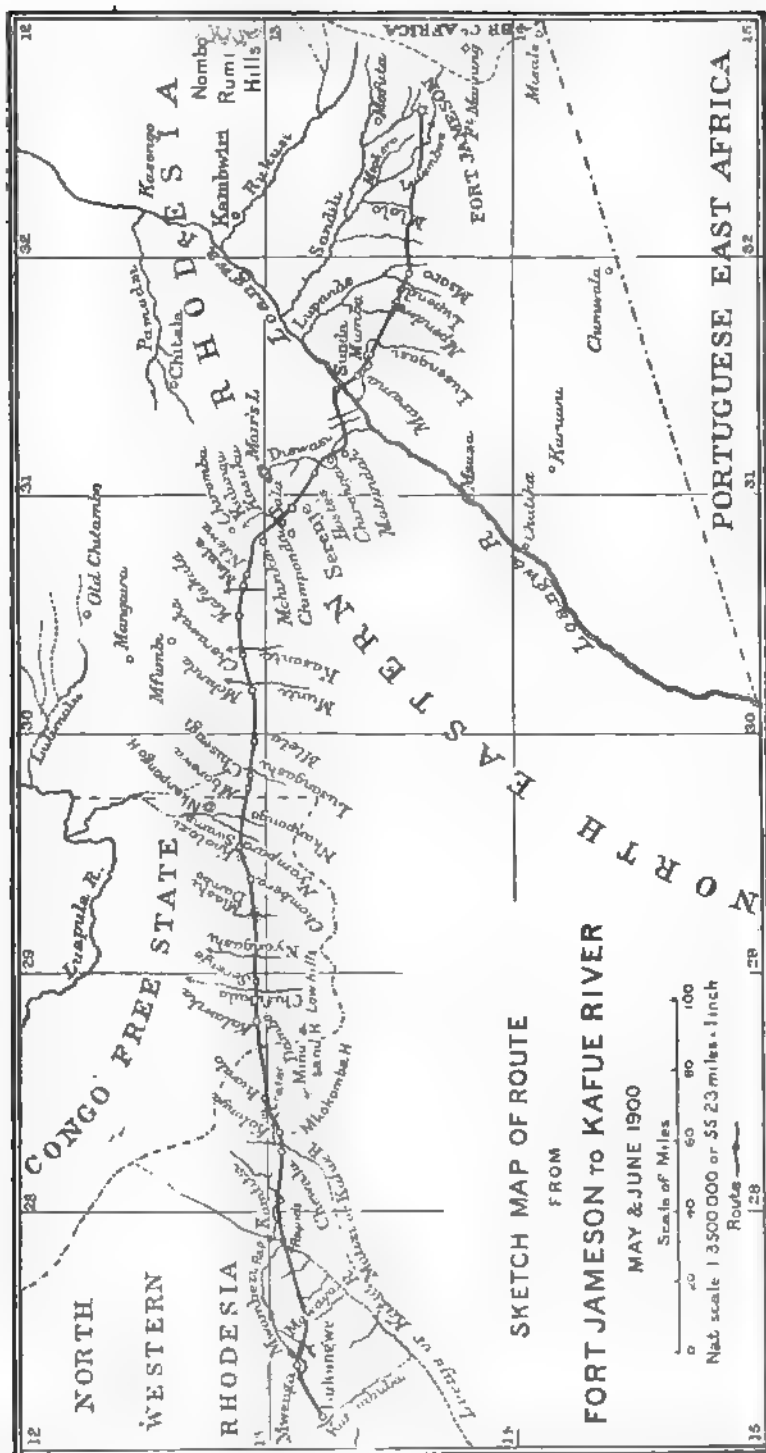
the north, east, and west, being especially chosen in order to watch the main routes through that part of the country. On one shoulder of this spur are the "Boma" or Government offices, the Native Commissioner's dwelling and outhouses, and on the other the Police Barracks. The usual temporary buildings of wattle and daub have been erected, but more substantially and tastefully arranged than one might have expected. Owing to the elevation of this station, almost 500 feet above sea-level, it is healthy, without doubt. We found it extremely cold there at this time of the year. The surrounding country has rather a weird aspect, owing to the method employed by the natives in growing their crops. The trees have been cut down and the wood collected into heaps and burned; and on these burnt portions "malezi" (millet) has been sown. This method is employed to enrich the soil by the potash deposited. It entails less work than the ordinary method of cultivation. Serenje, the paramount chief of the Walala people, lives within a mile of the "Boma," and is an extremely old and feeble man, apparently not in possession of all his faculties. Here a difference of dialect was perceptible, resembling Kimambwe.

Starting from Serenje, we proceeded in a north-westerly direction, and ascended a rocky ridge, crossed by a deep and broken ravine, arriving at Sala's village (Walala) at midday. Leaving this place, and traversing an undulating, wooded country, well watered, we camped at the Katunga stream, where we slept. Next morning we again passed through a country similar to that traversed on the previous day, and passed through several villages, the principal of which was Mchinka's, a large stockaded village, close to a rapid-flowing stream. Food and water were plentiful, but we found a few villages deserted, probably owing to their having heard of the approach of white men. A notable fact was the large quantity of tobacco grown around this portion of the country. Passing Ndewa's village, we arrived at Kafakula village. The country here became rather swampy, and the belts of bush denser. We were in the country inhabited by the Wabisa of Kambwiri's (the paramount chief of the Wabisa living on the left bank of the Loangwa). Leaving Kafakula village, and passing Cherawaka's, a small village on the Kasanta river, we arrived at Mchinda's village on the Munti river. There was no water between Cherawaka's and Mchinda's villages, the country between these two villages—a distance of 10 miles—being thickly wooded and uninhabited. At Mchinda's a good supply of food can be obtained, but the people, we found, were very timid and distrustful. Both the Kasanta and Munti rivers are streams of considerable size, and are crossed by rough native bridges consisting of felled trees interlaced by bamboos. A guide was essential for the latter part of this journey, owing to the network of paths leading to the several villages on the banks of the Munti. From Mchinda's we came to Mlela's village; crossing the Luambwa, a stream of some size, we

arrived at the Lusangashi river, more of a swampy nature, full of reeds, and very deep. Crossing the Lusangashi, we passed Chisengi, a large village, and slept at Mborewa's. Here the inhabitants were of the Walala race. Leaving Mborewa's, we traversed a long wooded spur, but without water until a small stream called the Nkanpongo was reached, to the north of which a high hill, also called Nkanpongo, rising 600 to 700 feet, was to be seen. Leaving Nkanpongo stream, about 5 miles farther we crossed a fast, shallow stream, the name of which I was unable to ascertain, and arrived after some distance opposite to Nyampara's village, situated some distance from the path. Here the native path makes an abrupt turn to the south, and crosses the Koatazi swamp, which was about 150 yards wide. The country between Mborewa's and Nyampara's is uninhabited and thickly wooded, and much fresh spoor of elephant was seen. Next morning, May 20, we arrived at the villages of Chombera, a chief of some importance. These villages are the border villages of the Walala and Walamba, Chombera himself being a Walala.

Here it was apparent to me that we were going too much to the westward and were south of the Luapula, and were already possibly within the Congo Free State. From information received here, I found that Chewalla's, my objective, was situated on the Kafu, more commonly known as the Kafue or Kafukwe, which I was aware lay in British territory, and that I should be obliged to traverse the bend of the Congo Free State territory to reach it. Having already travelled a considerable distance, and it being important that I should reach Chewalla's, I determined to push on although it left me a very small margin of time to return to Fort Jameson at the date stipulated by you, i.e. the middle of June. After leaving Chombera's we crossed the Lundi, Fulungani, and Nyangashi rivers, all considerable streams. The country traversed was thickly wooded and populated, the people being of the Walamba race, the principal village of which was Serenje's. It is a little confusing that the paramount chiefs of both the Walala and Walamba tribes should bear the same name.

The Walamba appeared to be strikingly superior in physique to their neighbours, the Walala, and, in fact, on first appearance to either the Angoni or Wabisa. They also appeared to be friendly and willing to work. From information gathered from Serenje, the Alamba country is bounded as follows:—On the north by the Luapula river; south by the Nika river; east by the Nyangashi river, and to the west by the Kaboshi river. The following are the names of their head chiefs:—Serenje, Kabola, Chikoloma, and Mshiri. After leaving these Walamba villages we traversed a tract of 26 miles of uninhabited forest country to Kavalo, a small village, though marked prominently in most maps. This uninhabited forest country was intersected by "dambos" or "vleys" from 300 to 400 yards wide, covered with long grass, with



water from 1 to 2 feet in the middle. Winding in and out of the belts of forest, these "dambos" could be followed for miles, their general direction being from south to north. They are, without doubt, the feeders of the many streams and rivers running into the Luapula. The open space in this forest country was covered with numberless white ant-heaps, conical in shape, very rarely more than a foot to a foot and a half in height. At Kavalo's I was informed we could reach Chewalla's in about four to five hours' march, which would be approximately 12 miles distant.

Chewalla's village is situated about 12 miles due west of Kavolo's, on the right bank of the Kafu, about 12 miles from its source, its position being about 29 E. long. by 13 S. lat. The village itself consists of about 150 to 200 huts, surrounded by a stockade by no means formidable, and differs essentially from the ordinary native ones in two respects, firstly, the huts are built rectangular, with windows and courtyards; and, secondly, there is an attempt at dividing the village into streets. The inhabitants are Swahili, ordinary natives, and cross breeds. The Swahili are distinguishable by their white clothing and caps. There is domestic slavery, without doubt, in existence here. Large quantities of rice are grown on the banks of the Kafu, and the people have a well-fed and prosperous appearance. In view of the friendly attitude of Chewalla's, I decided to allow Mr. Lyons to proceed to the Luapula district, and he left on the 24th inst.

Mr. Lyons reported to me later that, after leaving Chewalla's, he struck the Luapula river after travelling 61 miles in a north-easterly direction. He crossed at the village of Makoma in Chinama's country, where the river was about 400 yards wide and over 40 feet deep in mid-stream. The banks are clear, and have no marshy approach. From Makoma he travelled 27 miles to Meri-Meri's. On Meri-Meri being informed that an Administrative official had come to reside in his country he expressed great pleasure, saying he was always in dread of being raided by unscrupulous traders. He had, however, no complaints to make. Mr Lyons went on from Meri-Meri, some 50 miles, to Kalasa, from which place he reported to me that there were, so far as he could learn, no complaints against any of the Europeans trading in the Luapula district. Mr. Lyons describes the Luapula district, so far as he had seen it, as thickly populated. The villages are not large, but small groups of houses are scattered all over the country.

The Ba-Usi people are shy, but perfectly friendly. They have no cattle, but a few goats and a large number of fowls. Their crops are manioc, malezi, and sweet potatoes. In all the rivers an inexhaustible supply of fish provides the principal article of diet. On the Luapula large flotillas of canoes are always to be seen fishing, and hunting the hippopotamus. Crocodiles infest every stream and river, and it is unsafe to cross the smallest except in canoes. The country is gently

undulating, and water lies in almost every open plain. The timber is small and of recent growth, seldom more than 20 feet high.

Shortly after my departure, Mr. Kennelly made a rapid journey some 86 miles to the west of Chewalla's, passing through a very heavily timbered and well-watered country, generally level until near the Luenje, where there is a stretch of low granite hills. He struck the Kamjintse river 12 miles from Chewalla's, and followed its course for about 18 miles. This stream, which is of no great width, but of considerable volume, flows into the Luenje. The Luenje, or Kafue, at the point where Mr. Kennelly crossed it, is a splendid river, from 70 to 80 yards across. The banks are low, and lined with a fringe of splendid trees. The stream was about 14 feet deep. Bark boats were found there, which were quite serviceable. The bark is stripped off very large trees and the ends drawn together and pinned, leaks being stopped with clay.

From the Luenje to the Mwambezi river, about 34 miles southwest, the country is very flat; and Mr. Kennelly describes the timber as the heaviest he has seen in this country. Swamps are larger and more often met with than between Chewalla's and Serenje. The first signs of actual habitation met with was at Mwengo's on the Mwambezi river, although a great number of old villages were passed through, the former inhabitants of which have been harried by Chewalla, Chinama, and various black Arabs, who until lately infested the Luapula valley. The Mabunda people living along the Mumbeji river are said, even now, to carry their raiding expeditions in this direction. These people, the Walamba, are of splendid physique, shy, and harmless. They live scattered in the depths of the forest, far away from their gardens. Even the footpaths leading to their huts are concealed as much as possible, and the difficulty of finding them out for the purposes of procuring supplies for the caravan was considerable. Game, large and small, is plentiful; the hippopotamus infests the rivers. Elephants are not numerous, having been driven off by native hunters from the Luapula. Mr. Kennelly remarks that the name "Kafue," or "Kavu," is given by natives to all rivers of any size in which the hippopotamus abounds. In every case where a river was so called, he found on inquiry that there was a special and local name.

On May 25, accompanied by Mr. Holland, I started on my return journey for Serenje Boma, *en route* for Fort Jameson. From Chewalla's we went by the main path to Kavalo's, our previous route having been for the greater part across country, as before stated. About 8 miles on from Chewalla's along a thickly wooded portion of the road we came on what appeared an immense hole, with almost precipitous sides, 150 feet deep, with water at the bottom. The water was of a dark blue or green colour, and must have been extremely deep, probably fed by a subterranean stream. Whilst gazing at this beautiful spectacle, our

natives drew our attention to a crocodile sleeping on the surface. This was very curious, in view of there being no river within 8 miles. This place was also visited by Mr. Kennelly, who explored it thoroughly. He describes it as the crater of an extinct volcano, lying at a slight elevation between two "dambos" or "vleys." The upper rim is almost a perfect circle, with a slight lip-like break on the eastern side. The diameter is just 300 yards, a conclusion which Mr. Kennelly arrived at by finding the range of a mark on the opposite side with his rifle. A pool of water of a dark greenish colour lies about 150 feet below the rim, oval in shape, and some 250 by 180 yards. The depth must be very great. Mr. Kennelly exploded four charges of dynamite in the pool, well away from the sides, but nothing came to the surface, and he is of the opinion there are no fish in it. The water is fair, but slightly brackish. There was nothing to indicate that the water altered its level at all during the seasons, except a very faint line 2 inches above the present level. The native name for the crater is Chilengwe. They have a superstitious horror of the place, and did all they could to dissuade Mr. Kennelly from going down to the water, assuring him that there was a large snake there. The only possible way down was by means of the lip-like break in the rim, and it was certainly a rather dangerous descent.

On our return journey to Serenje we followed our previous route, and arrived there on the 2nd inst. without any incident worthy of record. One noticeable fact was, the natives at the several villages along the road did not appear so timid: on our return journey we did not find any villages deserted.

ON THE MAP OF KING OSCAR FJORD AND KAISER FRANZ JOSEF FJORD IN NORTH-EASTERN GREENLAND.*

By Dr. A. G. NATHORST.

As I have already stated in my preliminary note on the Swedish expedition to North-East Greenland, 1899,† published in this *Journal*, the chief geographical result was the discovery of King Oscar fjord and the mapping of the extensive fjord-system connected with it, together with that of Kaiser Franz Josef fjord, which was then visited for the first time since its discovery in 1870, the whole being thoroughly mapped on the scale of 1 : 200,000. While referring the reader to the above-mentioned note, as also to the detailed account in *Ymer*,‡ let me

* Maps, p. 104.

† A. G. Nathorst, "The Swedish East Greenland Expedition," *Geographical Journal*, November, 1899, p. 534.

‡ A. G. Nathorst, "Den Svenska Expeditionen till nordöstra Grönland, 1899," *Ymer*, 1900, p. 115, with map on the scale of 1 : 500,000.

now, with reference to the accompanying map showing the course of the *Antarctic*, and to the map of King Oscar fjord and Kaiser Franz Josef fjord, give an account of our previous knowledge of these regions.

Kaiser Franz Josef fjord was, as is well known, discovered by the second German Polar Expedition, with Koldewey in command, in 1870. The official report of this expedition* was accompanied by a "Carton über den Kaiser-Franz-Josefs fjord," of which we here give a reduced copy (Fig. 1).

This sketch represents the inner part of the fiord—inside Payer

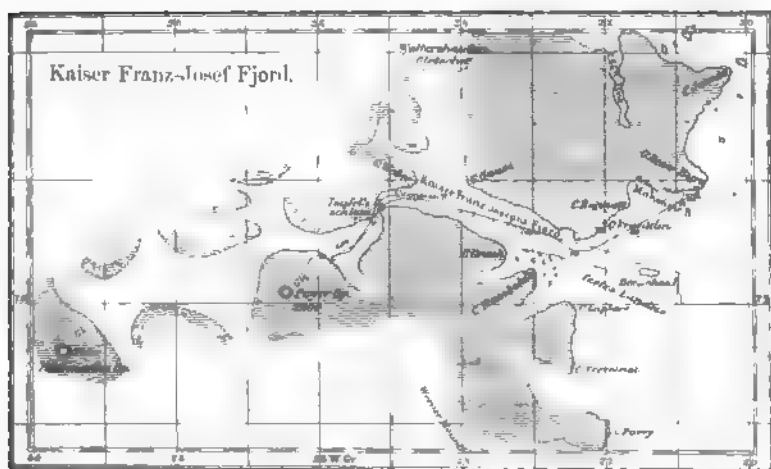


FIG. 1.—SKETCH-MAP OF FRANZ JOSEF FJORD (FROM 'ZWEITE DEUTSCHE NORDPOLARFAHRT').

Spitze—as broader and larger than the outer one, in contradiction to the general rule that the fjords grow narrower towards the interior. On the two maps of the east coast of Greenland which accompany this same work, the inner part of the fjord is entirely omitted, and consequently the fjord comes to a termination, though not fully defined, immediately above Payer Spitze (Fig. 2). There is, moreover, a further discrepancy, in that Petermann Spitze is placed on the first-mentioned map in 72° 48' N. lat. and 29° 32' W. long., while on the second it is placed somewhat north of 73° N. lat., and almost a degree of longitude farther east. In this, as in other respects, the two maps last-mentioned come nearer the true state of things than the first. Payer †

* "Die zweite deutsche Nordpolarfahrt in den Jahren 1869 und 1870 unter Führung des Kapitäns Karl Koldewey." Herausgegeben von dem Verein für die deutsche Nordpolarfahrt in Bremen. Leipzig: F. A. Brockhaus, 1873.

† J. Payor, 'Die österreichisch-ungarische Nordpol-Expedition in den Jahren 1872-1874 nebst einer Skizze der zweiten deutschen Nordpol-Expedition 1869-1870, etc.' Wien, 1876.

fjord, which sends two arms towards the west, and also one towards the north-east. This is the Ice fjord of the Swedish map, but there is no bay to the north-east. The fact that on the inner side of Payer spitze Franz Josef fjord does not widen, but is really narrower, is seen on simply glancing at our map. On the southern side there is only one fjord arm, not two, and the two indicated on the north side in the German official map do not exist. Nor does the inner part of the fjord make a bend to the north-west, but it runs due west. The south arm of the fjord has been called by me Kjerulf fjord in the place of that called by the same name by Payer, but which, as a matter of fact, does not exist. As Petersen island and Mohn island are non-existent as

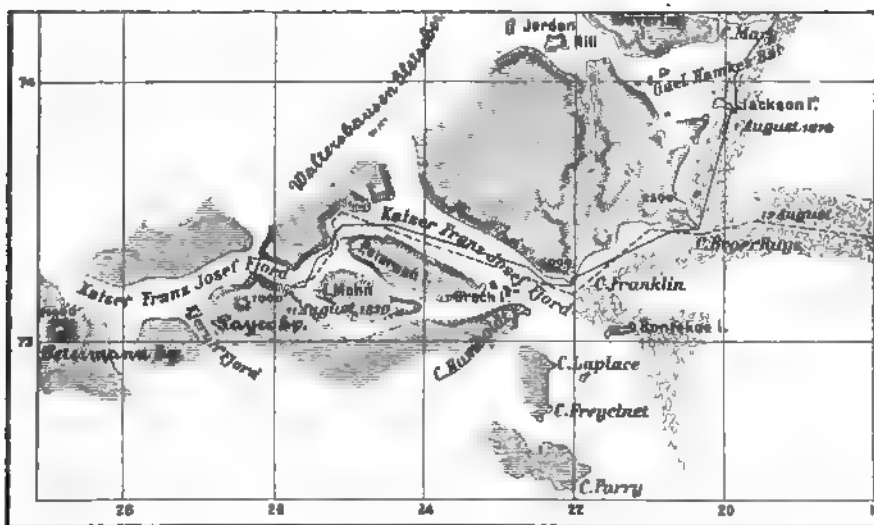


FIG. 3.—MAP OF FRANZ JOSEF FJORD AND ITS SURROUNDINGS (FACSIMILE OF PAYER'S MAP).

such, I have instead used the names for the western promontories of the supposed islands—Cape Petersen and Cape Mohn. As also, in consequence of the rounding of the coast, no Cape Gauss can be definitely distinguished, I have called the entire peninsula by that name. Otherwise the German names are retained—Teufelsschloss, Cape Weber, Waltershausen Gletscher, Eleonoren Bai—though the last mentioned has probably been employed for a bay lying somewhat more east than the one the Germans designated by that name. Kaiser Franz Josef fjord had, so far as we know, been visited by no one since 1870 until our arrival.

I will now proceed to summarize our previous knowledge of the tracts round the south and east outlets of King Oscar fjord. Our chief source of information was the celebrated voyage of discovery undertaken

by Scoresby, Junior, in 1822, when, for the first time, we obtained a fairly correct idea of the nature and outlines of the north-eastern coast of Greenland between 69° and 75° N. lat.* Fig. 4 is a facsimile of the portion of Scoresby's map showing the neighbourhood of Davy sound.

On August 10, 1822, the previous rainy and foggy weather showed

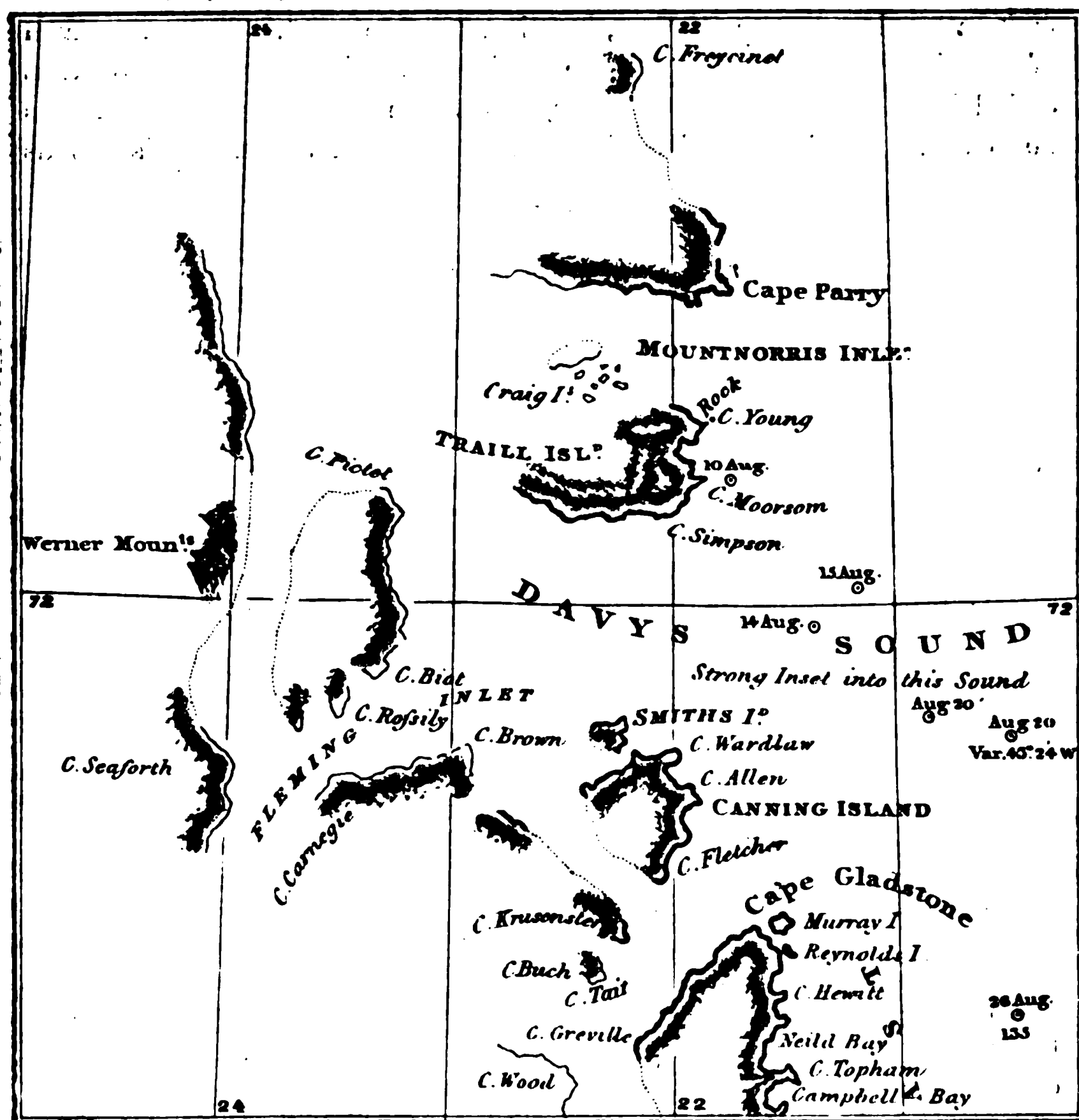


FIG. 4.—FACSIMILE OF PART OF SCORESBY'S MAP OF EAST GREENLAND, 1822. THE CIRCLES WITH DATES GIVE THE POSITIONS OF SCORESBY'S VESSEL, THE *BAFFIN*, WHENCE BEARINGS AND MEASUREMENTS WERE TAKEN.

some improvement in the afternoon, so that the coast could be approached, and the vessel made fast to a large sheet of land-ice $2\frac{1}{2}$ miles from the

* W. Scoresby, Junior, 'Journal of a voyage to the northern whale-fishery, including researches and discoveries on the eastern coast of West Greenland, made in the summer of 1822 in the ship *Baffin*, of Liverpool.' Edinburgh: 1823.

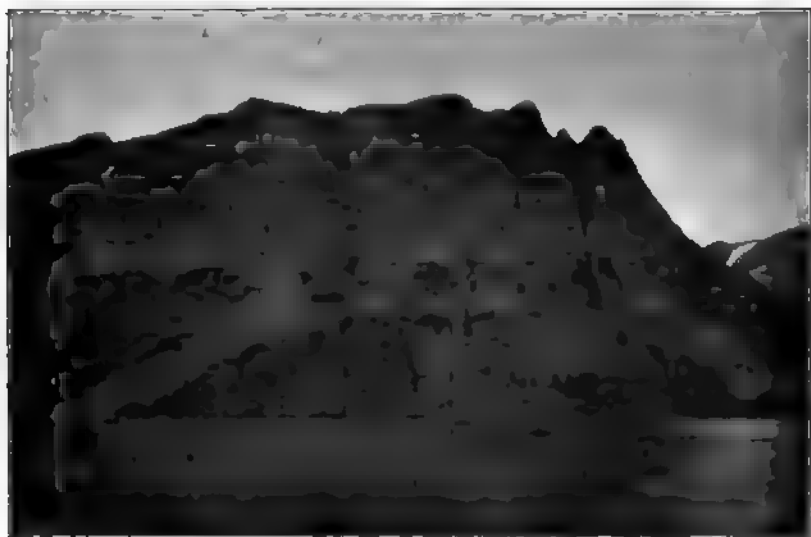


FIG. 5.—“DAS TEUFELSSCHLOSS,” HORIZONTAL SILURIAN STRATA, KAISER FRANZ JOSEF FJORD.

(From a photograph by P. Duxin.)

land, which was afterwards visited by Scoresby. We now cite his own words in so far as they touch on the geographical conditions.

“The land abreast of the ship (bearing N.W. by W., true) had every appearance of an island. It was named Traill island, in compliment to a highly esteemed friend, Dr. Thomas Stewart Traill, of Liverpool. The latitude of the middle of it is about $72^{\circ} 12'$. The south-eastern part of it is a stupendous cliff rising from the very sea, without a yard of beach, at an angle of 50° or upwards, to the height of about 1300 feet. This cliff is of singular beauty. The prevailing colour, which is slate-blue, or bluish-grey, is intersected and variegated by zigzag strata of bright yellow and red. From the peculiar structure and distribution of the strata of this part of the coast, it received the name of Vandyke cliffs. The northern termination of these cliffs consists of an acute ridge, jutting into a short promontory, which was named Cape Moorsom, out of respect to Mr. Richard Moorsom, Junior, of Whitby; and another headland, a little farther north, was called Cape Mewburn, after an old school companion and fellow-collegian. . . . The most remote headland of Traill island that was seen, lies about 5 miles to the northward of Cape Moorsom; this was named, after a reverend friend in Whitby, Cape Young.

“Traill island lies rather within, or to the westward of, the general line of the coast. Its extent in latitude is about 10 miles. To southward of it a very large inlet was discovered, which I named Davy's

sound, in honour of the much-respected President of the Royal Society. And, to the northward, another opening was observed, that received the name of Mountnorris inlet, in honour of Lord Mountnorris. The northern boundary of the latter inlet lies nearly east and west true, and is terminated to the eastward by a bold headland, to which the name of our enterprising and highly respected north-western navigator, Captain Parry, was applied. To the southward of Traill island, the land was but imperfectly seen, on account of a constant haziness in that quarter, which did not wholly disperse for some days."

Scoresby then describes his ascent of a mountain ridge at Cape Moorsom; and relates that in the vicinity of Cape Mewburn he found the ground-plans of two summer huts used by the Eskimo, with manufactured bones, etc. His father, who had crossed the country to Cape Simpson, had there found at least fifty similar summer residences, round which a vast quantity of bones of various animals were strewn on the ground. The following day, the king's birthday, bad weather prevented their getting on shore, and, as no further opportunity for landing offered, Scoresby's determination to take possession of the coast on behalf of Great Britain was never carried into effect.

A boating-party, under most unfavourable conditions, had penetrated to Cape Young, and stated that from this spot, looking into Mountnorris inlet, they had seen a number of islands which Scoresby called Craig islands, though he could not state their position more closely. Another



FIG. 6.—THE INNERMOST PARTS OF KAISER FRANZ JOSEF FJORD, WITH PETERMANN SPIZ.
(From a photograph by P. Duseh.)

party, penetrating to the ice-free southern side of Traill island, somewhat west of Cape Simpson, found several dozens of old huts and the ground-plans of summer tents, as also a vast quantity of the bones of various kinds of game, made into sleigh runners, etc. This spot would certainly be well worth a thorough investigation from an ethnographical point of view.

On August 14 Scoresby continued his examination of the coast. "Our position at this time was nearly in the middle of the opening of Davy's sound, of which the two islands last mentioned [Canning island and Smith island], and other land to the westward of them,



FIG. 7.—"STYLTOPPARNE" (NEEDLE POINTS) (1360-1570 METRES), ALMOST VERTICAL SILURIAN STRATA, KING OSCAR FJORD.

(From a photograph by P. Dustin.)

constitute the southern boundary, and Traill island the northern boundary; the width of the sound betwixt them being about 16 miles. A distant tract of a mountainous country was seen to run across the interior of Davy's sound. But it appears to be insular, and does not close up the sound. Three capes that were distinctly defined on the southern part of this island received the names of Cape Biot, Cape Rossily, and Cape Buache, in compliment to three French philosophers, members of the institute; and the north-eastern cape of the same island was called after Prof. Pictet, of Geneva. To the westward of this island there is a small chain of the most elevated mountains hitherto met with upon this coast. This chain, named Werner mountains, in

respect to the memory of the celebrated geologist, is distinctly seen at the distance of between 30 and 40 leagues, in the ordinary state of the atmosphere, and is so bold that it gives to the mountainous coast before it the appearance of low hummocky land. To the southward of Cape Biot is a ramification of the main sound, which was named Fleming inlet, after the esteemed author of the 'Philosophy of Zoology,' penetrating to the westward and southward; and between Cape Pictet and Traill island, Davy's sound runs towards the north-west, to an extent that, being beyond the reach of vision, could not be determined. As we had no opportunity of getting intersecting bearings of the land in the interior of Davy's sound, an accurate survey could not be obtained; but all that could be expected from a careful and repeated examination of the coast for estimating the distances and discovering the indentations and promontories, was accomplished. Two headlands, in Fleming inlet, received the names of Cape Seaforth and Cape Carnegie in compliment to two much-respected families of Edinburgh; and some promontories in the northern branch of Hurry's inlet were called after different friends, chiefly resident in the Scottish capital, whose names appear in the general chart."

Considering that, according to his own map, the distance from Scoresby's vessel to the supposed Fleming inlet would be about 32 miles, to Cape Seaforth more than 60 miles, and to Cape Krusenstern close upon 31 miles, it is evident that no great importance can be attached to the supposed existence of Fleming inlet, or that deep bay which, between Cape Krusenstern and Cape Gladstone, was supposed to stretch down to Hurry inlet. Lieut. Ryder long ago proved that, somewhat north of the Fame islands, Hurry inlet is closed, and Mr. Dusén, on his part, ascertained that the said bay does not run so far down from north to south as Ryder conjectures. The map of the northernmost part of Hurry inlet and surroundings made by Mr. Dusén having not hitherto been published, I take the opportunity of communicating it here (Fig. 8).

Returning to Scoresby's map, there is in it, besides, some uncertainty as to whether Canning island really is an island. The sound, which, according to Scoresby, should lie between Werner mountains and the supposed island on which Cape Pictet was placed, has been proved by our observations to be non-existent. The so-called island is in reality a part of the mainland, and the coast-line takes a very different course. As no Cape Pictet exists, I have transferred the name to a mountain.

Scoresby did so much at one stroke to increase our knowledge of the north-eastern coast of Greenland, that we can never feel sufficiently grateful to him. It must, therefore, not be taken as censure if I say that, like most other navigators, he was guilty of the fault of wishing to map far too much at too great a distance. It must not be forgotten

that low ground cannot be visible at a distance of 30 to 60 miles, for which reason the high mountains appear as islands and capes, the lower ground and valleys as sounds and fjords. Later on, when a complete survey is undertaken, it is often difficult to determine what the discoverer really meant when giving the names.

Concerning the question as to where Davy sound ends and King Oscar fjord begins, I have deemed it best to place the boundary between the two at an imaginary line drawn between Master's bay and Dream bay, i.e. at about $72^{\circ} 10'$, corresponding to the position of Cape Piotet and the western end of the south outline of Traill island in Scoresby's map. In this way Davy sound has been given exactly the same limits as in his. Future investigations will prove whether it really sends any ramification to the south-west or not.*

When Clavering turned homewards in 1823, on the conclusion of Sabine's pendulum observations at Sabine island, he followed the coast towards the south, and after passing Cape Broer Ruys on September 7, as also the bay between Bontekoe island and the mainland, which he called Foster bay (at the head of which "several inlets and fjords were observed"), he continued his course south along the coast at the edge of the land-ice, which still lay unbroken 5 or 6 miles outside

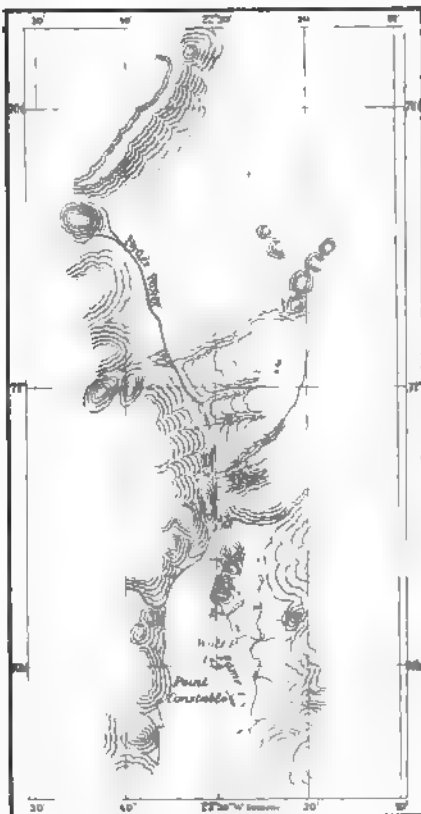


FIG. 8.—MAP OF THE NORTHERNMOST PART OF HURREY INLET AND THE SURROUNDINGS OF RYDER RIVER VALLEY, ACCORDING TO THE SURVEY MADE BY P. DUSÉN, 1899.† SCALE 1:500,000.

* The Danish expedition on board the *Antarctic*, 1900, has shown that I was wrong in supposing that Fleming inlet did not exist; but it is not so large as Scoresby supposed. Canning island was found to be a peninsula.

† The astronomical positions are from observations by F. Åkerblom —

1. Lat. $70^{\circ} 50' 2''$ N., long. $22^{\circ} 30' 5''$ W
2. „ $70^{\circ} 51' 9''$ N. „ $22^{\circ} 29' 5''$ W
3. „ $71^{\circ} 0' 6''$ N. „ $22^{\circ} 23' 2''$ W.

the shore. On the evening of the 8th the vessel was far beyond Cape Parry, and till September 13 they were busied in warping and hauling the vessel through the ice, which was very compact. A strong N.N.E. storm occurred on the 13th, during which their position was at times very critical, until at last it was found possible to force a passage clear of the ice. Clavering's most important discoveries were made farther north, outside the limits here mentioned, but in his map there appear for the first time the two islands afterwards called Mackenzie island and Franklin island. According to the course shown on the map, he steered between the former island and the mainland, but outside the island last mentioned. His diary (with map) was not published till many years after his death.*

Sabine has also given a brief description† of the geographical observations on the coast in question, made during the same voyage. His map differs from Clavering's in one respect, viz. he represents the *Griper's* course to have been east of or outside Mackenzie island, while Clavering, as previously stated, makes the course run west, or inside of it.

Seventy years now passed before any new contributions were made towards our knowledge of this stretch of coast, when, in 1891, a Danish expedition was undertaken under command of Lieut. C. Ryder.‡ The interesting discoveries made by this expedition in Scoresby sound and the mapping of the same cannot now be dwelt on. What is of interest for our purpose is the stretch of coast between Cape Broer Ruys and the Liverpool coast. Ryder in his map has marked with a special colour those tracts which were "mapped" by him, but it is patent that there can be no question of any real mapping, as the distance from the coast, as Ryder himself declares, was on an average 30 to 40 miles, while he adds, "This mapping may therefore be considered as a correction of the earlier maps as regards position, without laying claim to being satisfactory."

In our map we have followed Ryder's as regards the islands named after Bontekoe, Mackenzie, and Franklin; but it must be remembered that the position of these islands, more especially as regards the two last mentioned, is still only to be deemed approximate. The peninsula of Cape Parry has been incorrectly drawn by Ryder as an island, which is supposed to be separated from the land at Cape Freycinet by a broad arm of the sea. Traill island on Scoresby's map, i.e. that part south

* D. C. Clavering, "Journal of a Voyage to Spitzbergen and the East Coast of Greenland in His Majesty's Ship *Griper*," the *Edinburgh New Philosophical Journal*, vol. ix. Edinburgh: 1830.

† E. Sabine, 'An Account of Experiments to determine the Figure of the Earth,' etc. London, 1825. 4to, pp. 416-426.

‡ C. Ryder, 'Den östgrönlandske Expedition, utfört i Aarene 1891-92.' Förste Del, pp. 149-152. Meddelelser om Grönland, Heft 17. 1895.

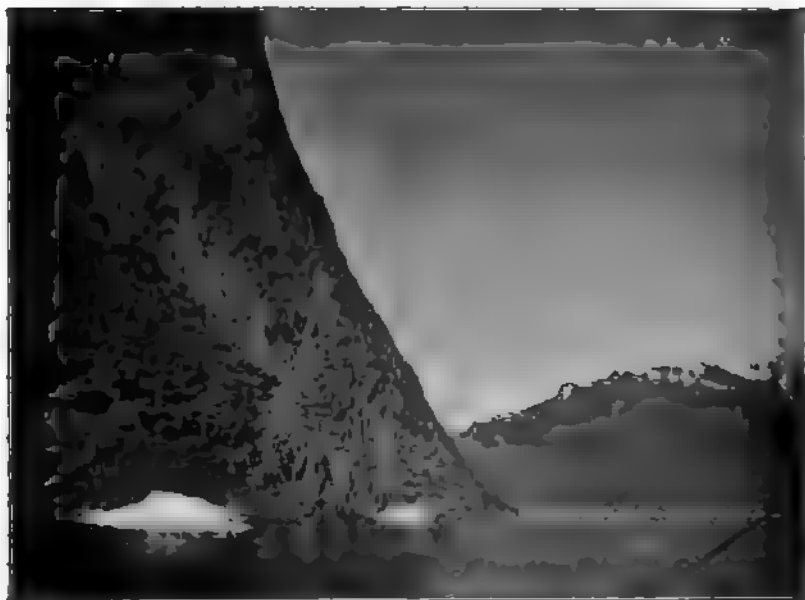


FIG. 9—"ALTESTUPAN," AN ALMOST PERPENDICULAR CLIFF (1500-1800 METRES PROBABLY) AT THE NORTH SIDE OF KAISER FRANZ JOSEF FJORD. AZOIC.
(From a photograph by P. Åkerblom.)

of Mountnorris inlet, has been made a separate island by Ryder, whereas Scoresby, as also in the case of Cape Parry, left it an open question. In this respect, therefore, Ryder's map is no improvement; moreover, he has moved not only Cape Parry, but also Traill island about 5 miles to the west. In accordance with our observations from Davy sound, which coincide with Scoresby's to a remarkable degree, the position of Scoresby's coast outline for Traill island may be quite correct; but as Ryder probably had some reason for the change made, this outline in the Swedish map has been placed somewhat more to the west than in Scoresby's, though I dare not aver that this is correct. In consequence of this, Cape Parry has again been moved somewhat to the east. Franklin island, which has not been moved, may possibly for this reason be placed too near the coast. It will be left to future expeditions to ascertain the exact facts.

The English Admiralty chart* had, curiously enough, as late as 1899, taken no notice whatever of Ryder's map of Scoresby sound, or the Danish charts published in accordance with it, but represents the coast in complete agreement with Scoresby's map. The name Davy sound has, for some reason or other—possibly from considerations of

* Admiralty Chart No. 2282, Arctic ocean and Greenland sea.

space—been placed in this chart just where King Oscar fjord really is, instead of between Traill island and Smith island. I cannot avoid calling attention to this, in order that undue weight may not be attached to the alteration introduced by the draughtsman.

With respect to the manner in which our map was executed, I entrusted the survey and mapping to Mr. P. Dusen, C.E., who, in a special paper in *Ymer*,* has given an account of the methods used. They may be briefly described as follows: After the measurement of a base-line about 2 miles in length on the eastern side of Kjerulf fjord, the neighbourhood of the two innermost ramifications of Franz Josef fjord were surveyed with the plane-table, a part only of Kjerulf fjord, which could not be reached by land, being filled in from a sketch by Dr. J. Hammar made during a canoe voyage. Taking the results so obtained as a starting-point, the rest of the mapping was carried out, by means of the plane-table, from the ship, for, owing to the calm weather which prevailed and the absence of currents, it was found possible to maintain a constant rate of 6 knots. At each change of direction, the time of which was accurately noted, the orientation of the plane-table was of course altered. The coast outlines in the narrower waters were sketched in by eye, but where well-defined points occurred on the shore, these were fixed by intersections. The



FIG. 10.—THE "ANTARCTIC" IN THE INTERIOR OF KAISER FRANZ JOSEF FJORD, NORTH OF KJERULF FJORD.

(From a photograph by P. Dusen.)

* P. Dusen, "Om kartläggningen af Kejsar Frans Josefs fjord och Konung Oscars fjord," *Ymer*, 1900, p. 229.

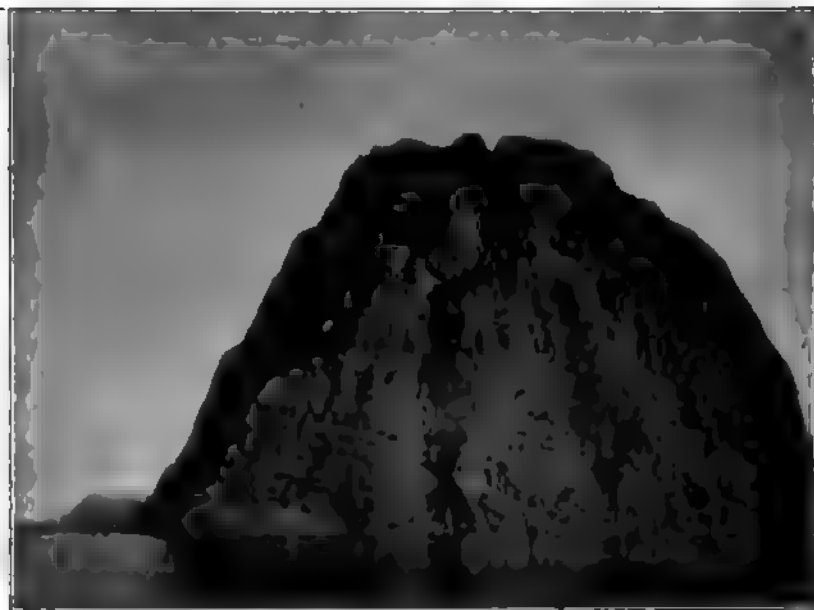


FIG. 11.—ELLA ISLAND (1210 METRES), SILURIAN STRATA, KING OSCAR FJORD.
(From a photograph by P. Duén.)

work was controlled by a series of astronomical observations for latitude and longitude by Dr. F. Åkerblom,* while those made by the second German Polar expedition in the neighbourhood of Payer Spitze were also utilized, the correctness of the astronomical determination of position by the same expedition at Cape Franklin having been verified. Altitudes were either estimated or determined from the ship by the photographic method, the position at the time being known. For the topographic surveys the photographic method, which it had been proposed to adopt, proved impracticable owing to the nature of the country. The original map was constructed on the scale of 1 : 200,000.

When I saw how very extensive King Oscar's fjord was, with its many ramifications, I found myself in a somewhat difficult position. From the very first I found that I must choose between the mapping of the two fjords and their scientific investigation, as the time at our disposal could not possibly be sufficient for both. As a matter of course, under such circumstances I regarded the mapping as the most important, as it was very uncertain whether so favourable an opportunity

* F. Åkerblom, "Positions géographiques déterminées par des observations astronomiques faites pendant l'expédition suédoise, au Grœnland en 1899." *Opferstigt af Kgl. Vetenskaps Akademiens Förhandlingar*, 1900, p. 763.

would ever again occur. During the rest of our stay, therefore, I made the vessel work exclusively in the service of the surveyors, and our investigations on shore were almost entirely limited to those occasions when we were obliged to anchor for the purpose of astronomical determinations. It therefore often happened that we passed without stopping a good many places the scientific investigation of which would, in one respect or another, have been specially desirable. Had the surveys not been undertaken, the expedition would have been a still greater success as regards geological, botanical, zoological, ethnographical, as also hydrographical results than it really was. Those who follow in our footsteps have now, however, a cartographical basis to work from, and should therefore be able to do good work in the directions mentioned. The researches which we were compelled to leave are still to be made.

In addition to what has already been said about the map, let me make a few remarks concerning two mountains which had previously been named. The one is Petermann Spitze in Franz Josef fjord, the height of which is given in the German map as 3480 metres (11,420 feet), and even, in *Petermanns Mittheilungen*, 1871 (title-page and table of contents), as 4267 metres (14,000 feet). That this height is greatly over-estimated was evident, but as we could obtain no intersections, but only photographs and bearings from one and the same direction, no accurate determination has been possible. Probably it is not very far from the truth to consider the altitude as between 2500 and 2800 metres (8000 to 9000 feet).

The second mountain, or rather chain of mountains, is that described by Scoresby as Werner mountains. On our way north from Scoresby sound to Franz Josef fjord, these high summits, as described by Scoresby and Ryder, were seen from afar rising considerably above their surroundings. But on our proceeding along the south-western side of King Oscar fjord, the mountains in question, or at least the greater part of them, were probably hidden by the high side of the fjord, for we could not recognize them with any certainty. The name has, however, been entered in the map at the same spot as in Scoresby's and Ryder's, but the figures of altitude cannot relate to the highest summits.

As I propose to give an account of the geology of the region in another publication, I will here but mention briefly its chief characteristics. Quite in the west there occur crystalline rocks—gneiss, mica-schist, and quartzite. Farther east—roughly east of an imaginary line from the west mouth of Antarctic sound to Polhem valley, and north and south in the same direction—the place of these is taken by formations of red, grey, and green schist, yellow sandstone, grey and black limestone, etc., belonging to the Silurian system. Whether Cambrian rocks are to be found in this series, I cannot say. East of the Silurian formation, i.e. approximately east of an imaginary line running from

Cape Weber to a little east of Ruth island, and still further, there is a vast series of Devonian sandstone (old red), the lowest chiefly greyish green, the uppermost red, in which I subsequently found *Holoptychius nobilissimus* and a new *Asterolepis*, determined by Mr. A. Smith Woodward, of the British Museum. East of this spot we find on the coast volcanic post-Devonian rocks, diabase or basalt, as also granite and syenite (probably also post-Devonian), the latter not unlike those of the Christiania fjord.

Although at various points, more especially in Antarctic sound, the Silurian rocks exhibit a folded structure, and may even be tilted up almost vertically, as, *e.g.*, in Syltopparne, there is some reason for uncertainty as to whether a real folded mountain chain occurs. In Mount Berzelius, the Teufelsschloss, at the Geologists fjord, and many other places, the strata are horizontal. In any case the folding, if such there be, must have taken place before the deposit of the Devonian strata, for they show merely local disturbances, or but slight dips. Whether the Devonian sandstone in the south part of King Oscar fjord has a superstratum of other kinds of sandstone, belonging to a somewhat more recent system, I will not discuss here.

Nor will I dwell on the very interesting dislocations (faults) that are found in several places, but only mention that *Mytilus edulis* and *Cardium groenlandicum* occur in a fossil state, together with *Astarte*, *Saxicava*, etc., in shell-banks and raised beaches, formed when the sea was higher than at present. Of these the first-mentioned species is of the greatest interest, as hitherto it has not been found either living or as a fossil north of Angmagsalik, $7\frac{1}{2}^{\circ}$ farther south.

THE ORIGIN OF MOELS, AND THEIR SUBSEQUENT DISSECTION.

By J. E. MARR, M.A., F.R.S.

1. ORIGIN OF MOELS.—It is well known that, when bare rock is exposed at the surface of the ground in upland regions, the ultimate outlines of mountains which have been shaped by denudation depend upon the climatic conditions. In arid regions, whether of frost or desert, the mountains possess what is known as house-roof structure, and exhibit straight sides; whereas when running water in the form of streams exerts a dominant influence on the sculpture of mountains, the mountain eventually shows a cross-section consisting of two logarithmic curves, of ever-increasing steepness as they rise from the base of the mountain; these curves meet at the mountain's summit. In regions where running water exercises a marked influence upon the character of the surface contours, the existence of a covering of vegetation produces considerable modifications in the superficial features. Vegetation, as is well known, tends to check transportation by running water, for the water sinks into the vegetable matter, and is discharged slowly, and accordingly a tract of land occupied by vegetation will, under similar conditions, possess fewer streams than a tract in which the surface is occupied by solid rock. At the same time, the existence of the vegetable matter assists weathering of the underlying rock, owing to the solvent organic acids supplied by the vegetation, and to the

sponge-like action of the layer of vegetable matter, which retains the acidulated water for some time in contact with the underlying rock.

The rock which is weathered is removed to a lower level, partly by the action of the wind, and partly by inconstant runnels of water. If, therefore, an original tableland be carved into blocks by stream-action, the resultant blocks if covered by vegetation will be affected by weathering, but not in a high degree by stream transport, and the ordinary concave curve of water-denudation will be replaced by the convex curve of weathering. This curve is seen on a small scale in the case of granite tors, where, however, the outline is not due to a cover of vegetation, but to the absence of streams, owing to the smallness of the scale.

Vegetation-clad summits, then, will possess a rounded outline, which is cha-

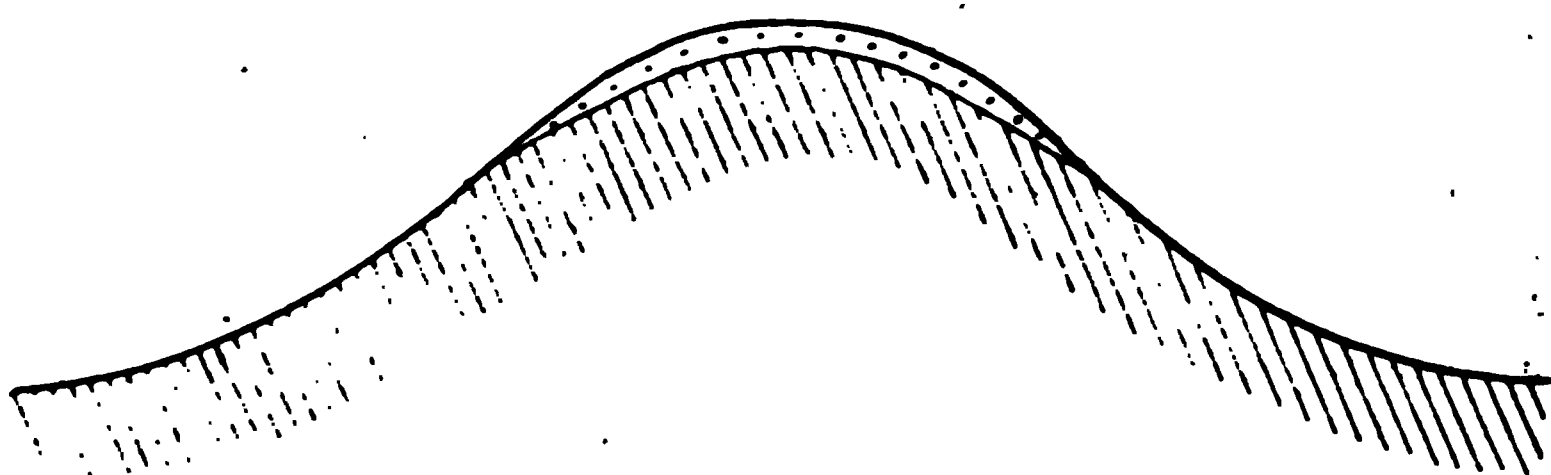


FIG. 1.—CROSS-SECTION OF A MOEL WITH PEAT. DIAGONAL LINES SHOW SOLID ROCK; DOTTED PART IS PEAT.

racteristic of certain Welsh hills known as *moels*; the term *moel* may therefore be used as a general term for hills of this character.

The detailed outline of the moel is to some extent dependent upon the character of the vegetation, which for this purpose may be considered under the two heads of marsh vegetation and forest vegetation. In the upland regions of our own country, marsh growth giving rise to peat, is extensive upon the gentle slopes

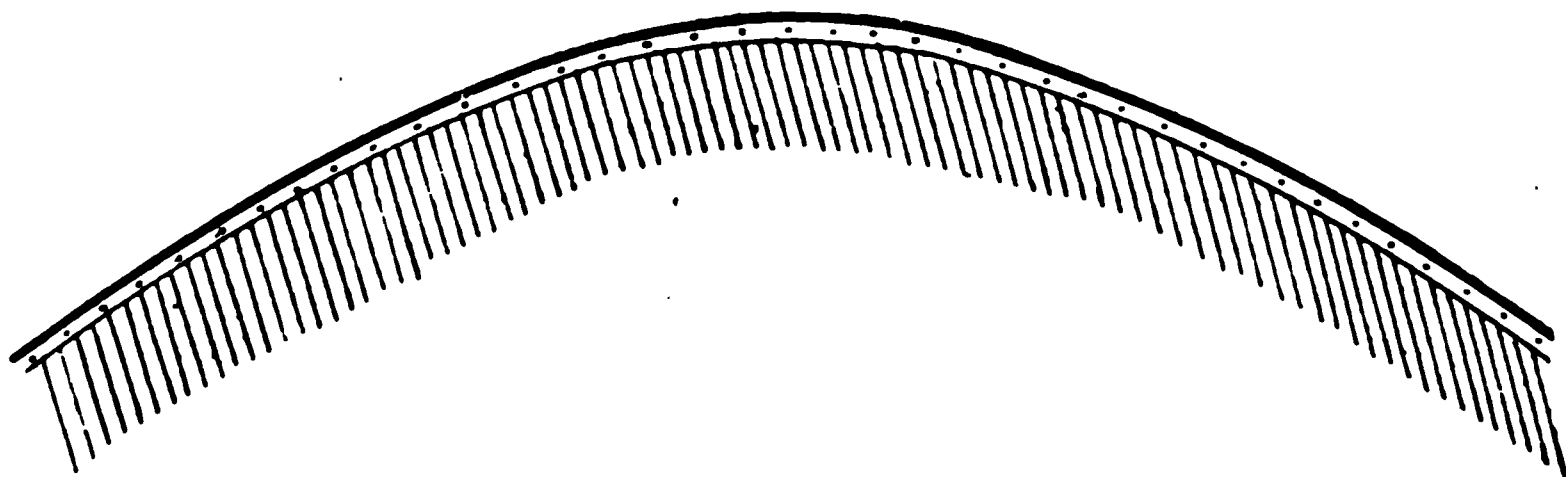


FIG. 2.—CROSS-SECTION OF A MOEL WITH FOREST GROWTH. DIAGONAL LINES SHOW SOLID ROCK; DOTTED PART IS FOREST SOIL.

towards the summits of the hills, where the angle is sufficiently slight to allow the water to remain stationary for some time; and accordingly we usually find the British moel with a convex curve towards its summit, and the ordinary concave denudation curve marking the steeper slopes towards the base of the hill, as shown in Fig. 1.

It should be explained that the gentle slope of the upper part of the hill is due to the original sculpture of a tableland into blocks by stream-action, and the

subsequent modification of these blocks. The upper parts of the blocks have gentle slopes, and allow vegetation to accumulate, while the steep valley sides, devoid of vegetation, are carved into concave slopes by the tributary streams coursing down to join the main rivers.

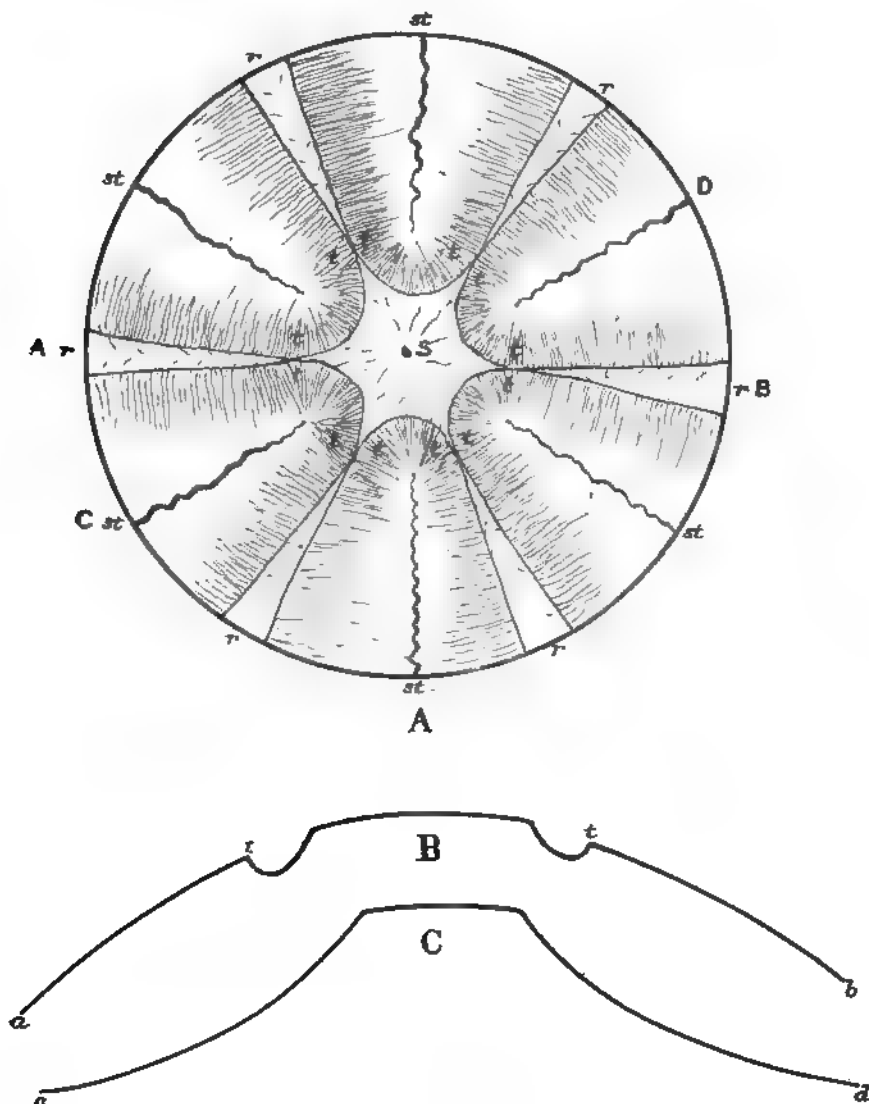


FIG. 3.—PLAN AND SECTIONS OF MOEL.

A.—Plan of Moel undergoing dissection: *s*, summit; *st*, streams; *r*, ridges; *t*, tahomas.
 B.—Section along the direction AB of plan *t*, tahomas.
 C.—Section along the direction CD of plan.

In forest-clad areas, such as the tropics and certain belts in sub-tropical and temperate regions, the trees are capable of maintaining their hold upon the ground

at slopes greater than those which allow the formation of peat, and the hills may therefore be clothed with vegetation to their bases, giving rise to a convex curve along the whole outline, as shown in Fig. 2, and also in Fig. 3, which is from a photograph of the Lachen valley, Sikkim, Himalayas, taken by Mr. E. J. Garwood.

It is clear that a structure generally similar to that possessed by a moel must also be produced in a ridge, if the latter is clothed with vegetation in the same manner, and accordingly we find that ridges with a covering of vegetable matter have the rounded cross-section which is seen in the case of a moel. This cross-section is exhibited in the case of comparatively low hills, such as the downs of south-eastern England, as well as in that of the turf-clad or forest-clad hill summits of upland regions.

2. DISSECTION OF MOELS.—If an ideal symmetrical moel existed in an area where climatic or other changes caused the disappearance of vegetation, though running water was still operating, or, to take a less extreme case, if the base of the moel were sufficiently devoid of vegetation to allow running water to exercise its ordinary eroding and transporting effects, a set of river valleys would be developed radially upon the moel. These valleys would gradually extend their heads backward and upward, and half-funnel shaped hollows, having the nature of corries or cwms, would be formed at the valley-heads, as described by Dr. G. K. Gilbert.*

Similar valleys would be formed, without any important climatic change, when the growth of peat had increased on the upper surface of the moel, to an extent sufficient to allow of the accumulation of a large quantity of water in the peaty covering. It is evident that this accumulation could not go on indefinitely; the time would arrive when the supply of stored water was so great that an exceptional rainfall would cause the supersaturated peat to discharge its water in floods; this water would form definite radial channels, and recession of the headwaters of these channels would extend backward and upward as before. As the recession of the headwaters of the streams continued, the half-funnel shaped hollows would approach and at last interfere with one another, owing to the diminishing distance between the stream-heads, as they drew nearer to the hill summit, until at last an arrangement like that shown in Fig. 4 would result.

At the points *t, t* in the plan, where two adjacent cwms coincide, and at *t, t* in the section *ab*, a gap would be formed, giving rise to a col between two adjoining valleys, and the ridge would rise up below this depression towards the base of the hill, and also towards its summit. The subsidiary peak thus formed on the ridge has been spoken of as a *tahoma* by Prof. I. C. Russell, in the case of Mount Rainier, Washington State, U.S.A.† In that particular case the formation of the tahomas is referred to glacial action, though there is no reason why the term should not be employed for this particular feature, whatever its origin may be.‡ Eventually the whole of the moel would be converted by erosive action into the normal mountain of water-erosion, with cross-section exhibiting a bi-concave curve. The formation of tahomas, then, marks an intermediate stage in the dissection of a moel.

Should the meteorological conditions in any region favour growth of vegetation on one side of a mountain only, the moel outline may be confined to that

* 'Geology of the Henry Mountains,' p. 115.

† See 'Eighteenth Annual Report U.S. Geological Survey,' Part ii., p. 349.

‡ Crib, Goch, and Lliwedd, on Snowdon, are tahomas formed by the interference of the cwms at the heads of the radiating valleys of Cwm Glas, Glaslyn, and Cwm-y-Llan.

side, while the other side is dissected by streams. In this way will be formed a hill with a convex curve on the vegetation-clad side, and a concave curve on the opposite one. This formation will of course occur also in the case of a ridge having a cross-section similar to that of a moel. As erosion will take place more rapidly where the running water can exert its influence, the hill will be by degrees destroyed, by the cutting back of the concave slope, as shown by the successive dotted lines in Fig. 5, which represent gradual cutting away from right to left.

In the case of a ridge, the divide will thus be gradually shifted backward, after



FIG. 4.—TERSTA VALLEY BELOW LACHEN

the summit of the water-curve has reached the original summit of the ridge. The dominant watercourses running down the rocky side of the ridge will cut backward at their sources, at a faster rate than the minor runnels which intervene between them, and at the heads of these dominant streams deep notches will be cut in the ridge, causing the divide to take a zigzag course, as seen in Fig. 6.

Such notches are seen in the case of some of the "bwylchs" (passes) of the ridge trending northward from Snowdon, the passes separating Moel y Cynghorion, Moel Goch, and Moel Eilio.*

* See Marr and Adie, *Geological Magazine*, December 4, vol. v. p. 51.

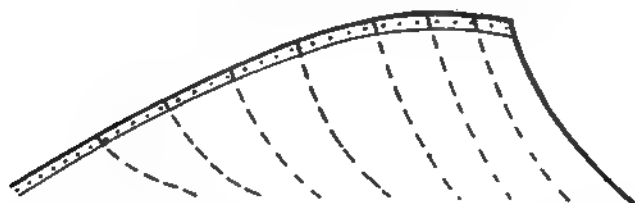


FIG. 5.—SUCCESSIVE STAGES IN DESTRUCTION OF HILL, WITH MOEL OUTLINE ON LEFT, AND STREAM CURVE ON RIGHT. DOTTED PART SHOWS VEGETABLE LAYER; THE BROKEN LINES SHOW GRADUAL RECESSION OF THE DIVIDE FROM RIGHT TO LEFT.

As a tract having a westerly aspect is favourable to the growth of vegetation in our own country, we frequently find ridges with the moel outline on the west, and with the stream-curve on the east, *e.g.* the above-mentioned ridge from Snowdon, and the High Street and Helvellyn ridges in Lakeland.*

As the result of this condition, an interesting contrast is noticeable between the character of the rocks on the east and west sides of such a ridge. On the west side, the presence of vegetation to some extent accelerates weathering by mechanical action of the roots, and by the solvent action of organic acids; and owing to absence of running water, this weathered material tends to accumulate to a considerable degree.

On the east side the absence of vegetation checks weathering, especially that wrought by solution, and such rock as undergoes weathering is readily cleared away by stream-action; accordingly, we frequently meet with fresh unweathered rock at the surface on the east side of the ridge, and of decomposed rocks near the surface and below the "regolith" (or superficial material) on the west side.

Of actual moels in Britain, one of the most symmetrical is Mell Fell, near Troutbeck Station, Keswick, and the smaller Dunmallet, at the foot of Ullswater, both formed of old red conglomerate. The moel outline is also frequently seen well developed in the Howgill Fells of West Yorkshire, and in the hills of the southern uplands of Scotland.

It is in the forest-clothed regions of the tropics, however, that we most search for the moel as the dominant form of hill-outline. There the dense vegetation

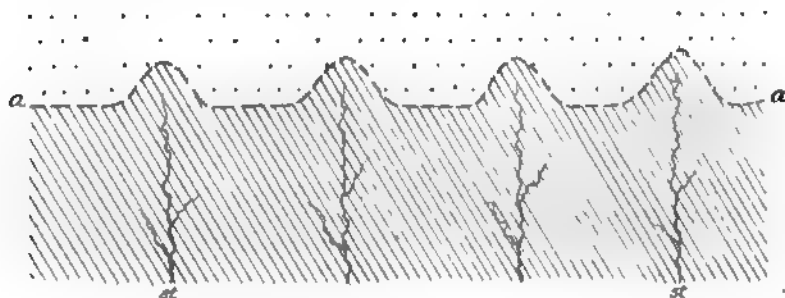


FIG. 6.—PLAN SHOWING FORMATION OF NOTCHES IN RIDGE, WITH VEGETATION-CLAD SLOPE ON ONE SIDE. BROKEN LINE *aa* IS THE DIVIDE; DOTTED PART IS PEAT COVERED GROUND; DIAGONAL LINES SHOW SOLID ROCK; *st, st*, STREAMS.

* Marr and Adie, *loc. cit.*

must effectually check the formation of the curve of stream-erosion, except at very considerable elevations.

The dominant forms of hills may be classified as follows, according to the climatic conditions under which they were formed:—

1. Moels, in the tropics.
2. Hills with house-roof structure in sub-tropical deserts.
3. Hills with curve of water-erosion in temperate regions.
4. Hills with house-roof structure in polar regions.

THE MONTHLY RECORD.

THE SOCIETY.

The Librarianship.—It is with much regret that we announce that Dr. H. R. Mill has retired from the office of Librarian to the Society, which he has held for nine years. The Council have placed on record their sense of the high value of the services which Dr. Mill has rendered to the Society, as well as to geography generally, during the period of his librarianship. Dr. Mill leaves the Society in order to associate himself with Mr. Sowerby Wallis in carrying on the work of the late Mr. Symons in connection with British rainfall. The Fellows of the Society will wish him every success in his new sphere, and at the same time hope that Dr. Mill's invaluable services may not be entirely lost to geography generally. Dr. Mill is succeeded by Mr. Edward Heawood, M.A., who for several years has been doing important work in connection with the library and the *Journal*.

EUROPE.

Distribution of Population in Southern Servia.—A careful and instructive study of the distribution of population in Southern Servia, as determined by the surface features of the country, is contributed to the *Abhandlungen* of the Vienna Geographical Society (vol. ii. No. 2) by Dr. M. V. Smiljanić. It is accompanied by a map in which all arbitrary generalizations are avoided, the actual facts being shown on a purely geographical basis, as was done for a part of Schleswig-Holstein by Dr. A. Gloy in a paper noticed some years back in the *Journal* (vol. i. p. 453). The region dealt with is that enclosed between the Southern and the Western Morava, extending to the southern frontier of the kingdom of Servia. This last is the most important boundary of the region, as, in addition to forming a political frontier, it is at the same time a geographical and ethnological line of partition. It runs almost entirely along a line of high mountains forming the water-parting between the Black sea and the Ægean, and broken in two places only by river-valleys, and has had a most important influence on the history of the Servian race. Orographically, the region embraces a mountain mass mainly composed of gneiss and crystalline schists, broken in places by eruptive masses, and passing northward through palæozoic strata to the tertiary basin of the Western Morava. The two main directions which prevail throughout the district are the west to east of

the Western Morava and the south to north of the Southern Morava, the principal mountain ranges and subsidiary valleys running at right angles to these two main valleys. A factor of much importance from an anthropogeographical point of view is the extent of forest, which, though much reduced, still covers the greater part of all the mountains and the higher valleys. Dr. Smiljanić pays special attention to the distribution in altitude—showing the comparative density in successive zones of 400 metres (1300 feet)—as also to the conditions induced by the composition of the soil, the direction of the river-valleys, and consequent aspect of the slopes. In the upper basin of the Western Morava, apart from the population of the only two towns which occur in the lowest zone, this is on the average less densely peopled than the second, which lies between 1300 and 2600 feet. This is attributed to the composition of the soil in the respective zones. In the next subdivision to the east (that of the Ibar) the population mounts to a higher level than in the first-mentioned—higher, in fact, than anywhere else in Serbia, houses occurring at an elevation of over 5200 feet. The reason is to be found in the comparative absence of sharp variations of altitude. In this district, also, the effects of aspect are very marked, the settlements on the east side of the Ibar differing both in size and position from those on the west side. In the more eastern parts, a much greater aggregation of the population at the lower levels, in part owing to the influence of the railway which follows the Southern Morava, is to be noticed. The northern slopes of the Jastrebac range are entirely uninhabited above the contour of 2600 feet. In the district of the Toplica, south of that range, the anomaly occurs of a population between 2600 and 3900 feet, little more than half as dense as that in the next higher zone. This is only to be accounted for by the emigration from the lower zones which has followed their transfer from Turkey to Serbia. The south-eastern parts of the region show a much denser population than elsewhere, especially below 2600 feet, owing to the exceptionally fertile character of the soil. In the last section the author discusses the type of the settlements, showing the great difference which exists in this respect between the east and west of the district, the latter being especially marked by the scattered nature of the settlements.

Explorations in the Southern Carpathians.—An account appears in the *Jahrbuch d. Siebenbürgischen Karpatenvereins* (summarized in *Globus*, vol. 78, No. 17) of explorations carried out by M. de Martonne in the *Massif* of the Paringu in the Southern Carpathians. While following up traces of former glaciation, M. de Martonne discovered a number of cauldron-shaped valleys not marked on our maps, as well as numerous mountain tarns, of which the existence had not previously been known. The largest of these lies in a hollow on the side of Mount Galcescu, at an elevation of 6300 feet. It lies entirely in a bed of gneiss, and has the form of a closed basin with a level floor and a maximum depth of some 35 feet. The shallow water extends for an unusual distance from the shore, owing to the deposits due to the rapid weathering of the neighbouring slopes, or brought down by the stream at the south end. The floor is covered with a deposit of mud reaching a thickness of over 3 feet.

ASIA.

Belgian Commercial Mission to Western China.—A Belgian expedition which left Europe in 1898, under the leadership of Colonel Fivé, to examine the commercial resources and mineral wealth of the northern and north-western provinces of China, has lately been brought to a termination, after encountering many difficulties owing to the unsettled state of the country. After traversing the provinces of Pechili, Honan, and Shansi, the expedition reached Lanchau-fu

in Kansu, where it divided—one party under Colonel Fivé exploring the neighbourhood of Kokc-nor, while the other, under MM. Henrard and Dedent, devoted its attention to various parts of Kansu. The first-named was unsuccessful in an attempt to reach the Tetung-ho, owing to the severity of the cold, many baggage animals being lost. News of the disturbances reached the expedition in Liangchau, and, after a return to Lanchau, it was found necessary (September 8, 1900) to take the northern route across the Gobi for Urga. In the journey across the desert many difficulties were encountered, partly through want of guides through the mountains, partly from the intense cold (accompanied by a biting wind) and from scarcity of water. Urga was, however, at last reached in safety.

Korea.—We learn from Mr. J. N. Jordan's 'Report on the Trade and Commerce of Corea for 1899' (Foreign Office, Annual, No. 2511, 1900), that during the year there was a diminution both in exports and imports, largely due to the stagnation of the rice market and the unsettled state of the currency. The coast trade between the treaty ports fell from £479,175 in 1898 to £383,561 in 1899, but this appears to be the result of a displacement rather than a decrease of trade. One of the chief events of the year was the opening of the Söul-Chemulpo railway, the pioneer enterprise of its kind in the country, which took place on September 18. The line is open for passenger traffic as far as Nodol, 22 miles from Chemulpo, and the entire journey, 29 or 30 miles, which previously occupied seven or eight hours, now takes between two and a half and three and a half hours to accomplish. It will probably not be completed before the spring of 1901. Owing mainly to the difficulty in raising the necessary capital, work on the Söul-Fusan railway has not yet commenced. It is proposed to build a light railway between the capital and Mokpo, the latter a fast-growing port about equi-distant from Shanghai and Nagasaki, with a fairly good harbour. An increase in the export of gold from Korea to the extent of £55,765 during the past year is reported. The Unsan gold-mine in the Ping-an province, now owned by a British syndicate, is considered to be the richest mine in the country. The district has been re-named "Gwendoline." On May 1 the three new ports of Kunsan, Masampo, and Songchin were opened to foreign trade. Of the three, Kunsan has the largest trade, but Masampo, which possesses a fine harbour and is situated in a rich district, is likely to develop into a port of some importance. Ping-yang, a large inland city about 44 miles from the port of Chinnampo, is now open to foreign residence and trade.

Progress of the Indian Survey.—The 'General Report on the Operations of the Survey of India' for 1898-99, recently received, records a total outturn of survey during the year of 95,934 square miles, as compared with 36,199 square miles during the previous year. The increase this year is said to be due to the large amount of reconnaissance in Yunnan and along the Burma-China boundary, etc., on the $\frac{1}{2}$ -inch and $\frac{1}{4}$ -inch scales, the former amounting to 2043 square miles, and the latter to 64,840 square miles. An important work was completed during the season by the Trigonometrical Survey party—a junction having been made between the India and Burma triangulations. Several angles were re-observed at the most eastern stations near Manipur, and the results proved that there had been no disturbance in that part of Assam from the great earthquake of 1897. The Government of India has decided to undertake a magnetic survey of India, but this work will probably not be commenced before the end of 1900. Progress has been made in geographical surveys and reconnaissances. An area of 2043 square miles of survey on the scale of $\frac{1}{2}$ -inch to 1 mile was completed in Kashmir and Gilgit, and a large addition made to our knowledge of the geography of the frontiers of India, amounting to some 65,000 square miles of geographical reconnaissance on the $\frac{1}{4}$ -inch scale. Topographical survey work is making good progress, more

particularly in Burma. The re-survey of the whole of Sind was commenced in 1895-96, and about 4000 square miles a year are being mapped.

The Meaning of Hadramut.—In a note inserted in the ninth number of *Petermanns Mitteilungen*, Dr. Alfred Jahn, a member of the Austrian expedition of 1898-99 to Sokotra and Southern Arabia, suggests a new derivation of the name Hadramut, holding that those previously put forward cannot be considered satisfactory. Dr. Eduard Glaser derived the name from the root *hadhrama*, the only meaning of which applicable to the case would be "land of harsh utterance." The feminine termination *ūt* or *ôt* shows, Dr. Jahn says, that the word is of Himyaritic-Mehritic origin. But although the Mehri and Dhafari dialects spoken on a portion of the coast might well give rise to such an appellation, the term is certainly not applicable to the whole of Hadramut, in parts of which the Arabic tongue is preserved in greater purity than in Northern Africa or Syria. Dr. Jahn's explanation is based on the fact that the form Dharmut was found to be in use in the Mehri dialect, and although his extensive vocabularies of this speech do not include such a root in a verbal form, it frequently appears in Arabic, always with the notion of kindling fire or some analogous sense. Hadramut, therefore (the first syllable being the prefix common in Southern Arabia), would mean "land of burning," a sense thoroughly consistent with the excessive temperature which prevails in spring and summer.

AFRICA.

The Blanchet Expedition to Adrar.—As stated in our last number, an account of the recent French expedition to Adrar, in the Western Sahara, is contributed to the *Annales de Géographie* (November 15, 1900) by Dr. Dereims, the geologist of the party. From April 1 to 24, 1900, the expedition followed the coast north of the Senegal, the country here forming a wide bush-covered plain, probably of Pliocene age, sloping gently towards the sea. A chain of dunes, 650 feet high, border the coast, behind them running a series of lagoons, forming salt pans in the dry season. Low fixed dunes, covered with vegetation, also occur farther inland. After visiting the old lagoon of Timardine, filled with gypsum and sulphur, separated from the sea by a depression running far to the north, the expedition struck east across a waterless district for Tuizikt, 120 miles from the coast, the only permanently inhabited spot between St. Louis and Adrar. It is the residence of the Sheik Saad Bu, the same to whom the traveller Soleillet owed his life, and who also, later on, proved a good friend to M. Blanchet. Beyond this spot the ground was composed of sandstones and ferruginous quartzites, with veins of quartz and manganese. The formations show traces of much disturbance, though the surface has been levelled by denudation, apart from some bare hills of sandstone. At Tabringut, about 60 miles east of Tuizikt, the great plateau, composed of crystalline schists, which stretches from Bakel in the south to the *Sebkha* of Ijil in the north, is reached, and 20 miles beyond occurs the steep escarpment of the Adrar plateau, which from the west has the appearance, as the name implies, of a mountain mass. Adrar proper forms the most elevated part of the plateau, and is bounded towards the east by a sudden drop, due to one of the series of faults, running from north to south, by which the whole region is traversed. To these are also due the longitudinal depressions where alluvium has been carried by the action of the rain, thus determining the position of the oases. The first reached from the west is Atar, which has a permanent population of two thousand, but which is a wretched spot. The next in order, on the score of population, are the oases of Shingeti, Wadan, and Ujeft, Shingeti being the chief commercial centre of the country. The caravans which start hence take to St. Louis gold-dust, ostrich

feathers, and dates. The population of Adrar is divided into two castes: those of warriors and herdmen, the former living largely by plunder. As previously stated, Atar was the farthest point reached by the French expedition.

Régime of the Senegal.—In a note in the November number of *La Géographie*, M. Lenfant describes briefly the annual rise of the Senegal with special reference to the navigability of the river. He begins by showing the differences which exist between the Senegal and the Niger, the lakes connected with the middle course of the latter acting as regulators of the flood waters, and maintaining the same at a fairly constant level. The Senegal, on the contrary, especially below Kayes, has the character of a long trench with vertical walls, down which the flood water rushes in a torrent, and is carried off with great rapidity. At low water the banks rise to a height of 30 to 40 feet above the river. While the rise of the upper Niger begins early in May and ends in October, that of the Senegal begins in June and ends in September. It is due to the rains in the Futa country, and to occasional violent storms on the lower rivers. The rise in the Bafing and Bakoi takes a considerable time to make itself felt at Kayes, but the flood water of the Faleme passes down quickly to Bakel, where the water-level is always higher than at Kayes at the same period. The curves drawn by M. Lenfant to represent the course of the rise, show, especially from July to October, a succession of fluctuations, with, however, a general increase in height to the end of August or beginning of September, at which the absolute maximum occurs. Steamers drawing 4 feet 3 inches can ascend to Kayes from July to October inclusive, while boats of shallower draught (1 foot to 2 feet 6 inches) can reach the same point from the beginning of June to the middle of November, transport being effected during the rest of the year by flat-bottomed barges. Ocean-going vessels which have been lightened at St. Louis so as to draw from 11 to 13 feet can ascend to Kayes during August and September.

Exploration between the Sangha and Ubangi.—A journey of exploration was made in March and April, 1900, between the lower courses of the Sangha and Ubangi, by Captain Jobit, a member of the survey party, headed by Commandant Gendron, lately sent out to the Congo by the French Government. The district in question is traversed by a tributary of the Sangha, which has been named the Grassy Likuala in distinction from the other river of the same name which joins the Congo just below the mouth of the Sangha; but its course had until this year remained unknown. Starting from Pembe, on the Sangha, in $1^{\circ} 15' N.$, the expedition traversed the tropical forest which clothes the banks of the river, and which here has a width of 50 miles. A few miles from the Sangha the forest became marshy, the surface being covered with a layer of liquid mud, which has a depth of 3 to 4 feet even in the dry season. Villages are placed on slight elevations. This forest is exceedingly rich in caoutchouc-yielding plants, both *Landolphia* and *Ficus*. The dividing-line between the basins of the Sangha and Likuala was imperceptible, but in about $16^{\circ} 45' E.$ a marsh was reached, drained by the Baili, a tributary of the Likuala, through wide grassy plains. This marks the limit of the country of the Basangas, that of the Balingos, a totally distinct race, being now entered. The men are well formed, and have an average height of nearly 6 feet. They wear only a covering of reeds. The Balingos are great fishers, but live principally on bananas, no manioc being cultivated. Their villages are differently arranged to those generally seen on the Congo, the houses—50 feet long—being scattered irregularly among groups of bananas. The Baili is 3 to 10 feet deep at low water, but has a feeble current. At its junction with the Likuala (which was descended in canoes to its mouth) both streams are about 60 yards wide and 6 to 7 feet deep, but, according to native report, the Likuala

comes from a long distance. In its lower course, it has a breadth of from 200 to 400 yards, between sandy banks 10 feet in height, winding through swampy plains covered with tall grass, which, owing to the constant moisture, can never be completely destroyed, even by fire. Trees occur in patches, but near the equator oil-palms appear instead. As might be expected from the nature of the country, the Likuala is connected, by diverging branches, both with the Sangha and Ubangi. Captain Jobit's map is based on six positions determined astronomically by the theodolite.

Dr. Cureau's Map of the Upper Ubangi.—We some time ago referred (*Journal*, vol. xiii. p. 69) to the surveys executed by Dr. Cureau, a member of the Liotard Mission, to the borders of the Bahr-el-Ghazal, in the region of the upper Ubangi and Nile-Congo watershed. A large-scale map (1: 1,000,000) embodying the results of those surveys, as well as the work of earlier travellers, has now been published in the October number of *La Géographie*, with full explanatory details as to the methods of survey employed, which should prove of use to intending travellers. The use of the sextant in Tropical Africa is strongly deprecated, the comparative advantages possessed by even a small theodolite being insisted on. In view of the exceptional difficulties which beset the observer, in a country where nights favourable for astronomical observations are in a proportion of about one in four, and where disturbing conditions of all kinds exist, Dr. Cureau shows the importance of combining, in the instrument used, the minimum of weight with the greatest possible simplicity of operation. The extent of calculation entailed by the methods adopted should not enter into the question, as these can be carried out more at leisure. From the evident care displayed in the execution of the surveys, Dr. Cureau's map marks a decided advance in the cartography of the region in question, and the longitudes observed are of particular value. The positions of the following four stations obtained by circum-meridian altitudes and occultations serve as the basis of the whole:—

Place.	Latitude N.			Longitude E. Greenwich.			Altitude.
	°	'	"	°	'	"	Feet.
Jema	6	3	19	25	16	0	2198
Tambura	5	35	24	27	22	0	2040
Zemio	5	1	48	25	8	0	2080
Dem Ziber	7	42	53	26	8	45	2198

The last of these is the site of the old Egyptian station in the Western Bahr-el-Ghazal, which was placed as the result of Dr. Junker's surveys in $7^{\circ} 36\frac{1}{2}'$ N., $26^{\circ} 15'$ E., so that its position is now considerably shifted. Zemio is an important French post on the Mbomu; Jema, one in the northern basin of the river; while Tambura was the French post established by M. Liotard, near the upper Swe, a tributary of the Bahr-el-Ghazal. The positions of some twenty-four subordinate points were also determined. Among the rectifications introduced, it may be mentioned that the confluence of the Welle and Mbomu is now placed in $22^{\circ} 20'$ E. instead of in $22^{\circ} 37'$, as shown in M. Wauters' map of the Congo State.

The Northern Districts of German South-West Africa.—The account of a recent journey in Northern Damaraland, by Herr Watermeyer, an agricultural expert, contains some useful notes as to the progress and possibilities of settlement in the northern parts of the German territory. One of the most important stations in this direction is Grootfontein, which lies in a district favourably situated in the matter of rainfall, in that this takes the form of long-continued gentle rain, which

penetrates the soil and causes it to long retain its moisture. The effect of this is seen in the unusual height of the anthills in the neighbourhood. Experiments at cultivation, especially of tobacco, have met with success. Fruit-trees are also grown, while the cultivation of coffee, sugar, the vine, etc., is recommended. The district is well suited for settlement, and field crops may be grown after the rains. The bed of the Omuramba to the east would afford scope for the storage of water by means of dams. Trees of several kinds, serviceable for timber, grow luxuriantly, even on the limestone hills, which in other parts of the country are arid and bare. Otavifontein, a little to the west, has a still better water-supply, and both field and garden crops are grown to a considerable extent, but more might be done in the future. Still further west, in the direction of Utyo, the country is suitable for pasturage, though the water-supply is not at present large, but, as elsewhere, might probably be improved. There is little settlement at present in the neighbourhood of Utyo, which lies on a limestone terrace, and where water-storage by means of dams might be feasible. At the stations visited on the return journey, south of Utyo, the conditions do not appear quite so favourable as further north, but some progress in cultivation is recorded. The roads in the north are generally good, especially one recently made from Otjimbingue to Karibib.

M. Dècle's Expedition.—Writing on July 25 last from the German station of Bukoba, on the west side of the Victoria Nyanza, M. Dècle gives some details as to his survey between the upper Kagera and the lake. He had *en route* explored the system of Lake Urigi, which, he says, has an outlet to Lake Victoria by the Luampindi river. This would seem to point to a direct connection with the lake, whereas previous travellers from Speke onwards have spoken of a connection with the Kagera. According to Captain Herrmann, whose map, published in the *Mitteilungen aus den Deutschen Schutzgebieten* for 1899, is the most complete we yet possess of this region, Urigi overflows northwards into the Kagera during the rainy season, and the temporary nature of the overflow, in this direction at least, is confirmed by the fact that no outlet was found by Stanley, who crossed the old bed of the lake near its north end. Captain Herrmann's surveys seem, however, to preclude the possibility of an outflow eastward to the Victoria lake. M. Dècle found the country between 3° S. and Bukoba exceedingly difficult to survey, as it consists of a mass of rolling hills merging into each other, with no well-defined valley or range of mountains. A vocabulary of the Usui language, which is remarkable as differing almost entirely from those of neighbouring tribes, though possessing some words similar to those used in Uganda, was collected. Among other points of interest, perfectly defined imprints of a human foot and of goats' feet were observed in the solid rock, and careful tracings made.

Trade of Adis Abbaba and Harrar.—From the recently issued Consular Report on the trade of Adis Abbaba and Harrar for 1899-1900, we learn that under the present orderly government of the country trade is increasing. The value of the import during the year considerably exceeds that of the exports; the staple imports being American sheeting, though other cotton goods came chiefly from Manchester. A brief description is given of the principal trade routes, shown on an accompanying sketch-map, with the average time occupied on each journey. The chief trade route runs from Adis Abbaba, *viâ* Chercher, to Harrar, whence goods are carried either to Zaila or to Jibuti for shipment. The bulk of the import trade is also carried on by this route. Another road leaves the Zaila or Jibuti—Harrar road near Biya Kaboba, and runs thence, skirting the northern limits of Harrar province, past the northern foot of Mount Asabot, and joins the Harrar—Chercher—Adis-Abbaba road near Tadechamalka. Other trade routes indicated are those from the capital to Matamma, Massowa, the Beni-Schongul

country, and to the Leka country. Trade is carried on almost entirely during the dry season, which lasts from the beginning of September till the middle of June. The main products of the country are gold, coffee, ivory, civet, and salt. The trade in hides has rapidly diminished since the herds were decimated by rinderpest in 1894. Cotton grows wild in many districts, notably Minjar, Iffat, Walkaet, and in most of the country bordering on the Blue Nile. A large amount of tobacco is grown in the districts of Jarsalaffo and Wallega. Coffee grows wild in Gomo, but the best quality is grown in Harrar province. Iron ore is abundant in several districts, and extensive deposits of apparently inferior coal have recently been discovered in Gojam and Shoa. With regard to Harrar, an increase is noticeable in several articles of export, such as gold and ivory, skins, and gum arabic. The land appears to be well suited for agricultural purposes, and, with cheap means of transport, it is thought that a large export of cereals would ensue. The population of the town of Harrar may be estimated at 35,000.

AMERICA.

The United States Census.—The results which have now been published of the census taken on June 1 of last year, permit a general view to be taken of the broad characteristics of the movement of population during the last decade of the nineteenth century. The absolute increase during that period has been 13,141,064, an amount greater by about half a million than that of the increase during the previous ten years, though when reduced to a percentage of the whole population it is less than has been recorded at any previous census during the nineteenth century. It works out at 20·8 per cent., as compared with 24·9 per cent. in 1890. In only one State—that of Nevada—is a decrease (of 7·5 per cent.) recorded, though the rate of increase in the remaining States and territories of course varies immensely. Leaving out of consideration the territory of Oklahoma (increase 544 per cent.), which occupies a special position, the increase per cent. varies from 0·9 in Nebraska to 105 in Arizona. Grouped according to geographical divisions, considerable variations are also noticeable, the increase in the western division (35 per cent.) being naturally much higher than in the centre and east. The lowest percentage (17·8) occurs in the north central division, though the South Atlantic, with 17·9, is practically on the same level. In the North Atlantic division the increase rises to 20·9, and in the South Central division to 24·8. Of cities with a population of over 25,000 there are now 159, as compared with 129 in 1890. Nineteen now exceed 200,000, six exceed half a million, and three—New York, Chicago, and Philadelphia—have a total of over one million; New York, in which are now included Brooklyn and Long Island City, containing 3,437,202 inhabitants. The largest increase per cent. (54·4) has occurred in Chicago, Cleveland coming next with 46, while New York and Buffalo are equal with 37·8. Of the total of 20·8 per cent., about 14·8 per cent. seems to represent the natural increase, while 6 per cent. is due to immigration, which with a total of about 3,800,000 stands at a far lower figure than in the previous decade. Including Alaska and Hawaii, the grand total is now 76,210,820.

The Introduction of Reindeer into Alaska.—The reindeer was first introduced into Alaska as a factor in freighting and transportation, in 1892. From Mr. Sheldon Jackson's eighth annual report on the subject,* we learn that the year 1898 was one of more than usual interest. "It opened with the Government relief expedition, in charge of Lieut. D. H. Jarvis, of the United States Revenue Cutter

* 'Report of the Commissioner of Education,' vol. ii. chap. xli. pp. 1773-1796, in Annual Reports of the Department of the Interior, 1898. Washington, 1899.

Service, to the whalers in the neighbourhood of Point Barrow, Alaska, and with a Government commission to Lapland, Norway, for the procuring of a colony of Laplanders, and the purchase of a herd of reindeer trained to harness, to be used in transporting relief to the destitute people in the mining regions of Alaska; also the establishment of a new reindeer station in the neighbourhood of Unalaklik, 60 miles north of St. Michael." The value and extent of reindeer transportation in Alaska is clearly set forth in a circular prepared by the Hon. W. T. Harris, Commissioner of Education, the main points of which are quoted in the report. He points out that reindeer will prove a useful auxiliary to both steamboat and railroad in Alaska, "by rendering possible a ready distribution, even for long distances from the terminus." "They would likewise collect freight for the terminus," and would be useful in carrying the mail. By their means the military camp at Weare, near the mouth of the Tanana, could be brought into communication with the War Department, and in various other ways they would prove of great usefulness. The total number of domestic reindeer in Alaska in 1898 was 2062, distributed as follows: Unalaklik, 671; Teller reindeer station, 197; Cape Prince of Wales, 216; Golovin bay, 395; Point Hope, 48; Point Barrow, 391; and Circle City (imported from Lapland), 144. Reindeer rendered important service during the Government relief expedition to the ice-bound whalers at Point Barrow. News reached San Francisco in November, 1897, that eight whalers were fast in the ice east and west of Point Barrow, and that the crews were in danger of starvation. Accordingly, the revenue cutter *Bear* was ordered to make the necessary preparations, and proceed as soon as possible to Bering sea. It was arranged that the *Bear* should proceed north until it reached the ice, and then land a party that should go to Point Barrow and take control of the whalers. Herds of reindeer were to be borrowed at Cape Nome and Cape Prince of Wales for the use of the expedition. The party were landed on December 16 at Cape Vancouver, and a start was made on the overland journey on the 18th. After many hardships, Point Barrow was reached by Lieut. Jarvis on March 29, 1898. This remarkable journey of 2000 miles through an arctic wilderness in midwinter, over an unknown region, was thus brought to a successful termination. The proceedings in connection with the Government commission to Lapland, already mentioned, are prominently dealt with in the report; 539 reindeer were shipped, 418 sledges, 511 sets of harness, besides 113 emigrants—Lapps, Norwegians, and Finns. These people will, it is thought, form a very valuable and important addition to the population of Alaska and the development of its resources.

The American Inter-Continental Railway.—Of the great railway projects of which so much has been heard within the past few years, the most ambitious is, without doubt, that which has found favour in the United States for a great trunk line to link together the various republics of North and South America, and supply through communication from New York to Santiago, Buenos Ayres, and Rio de Janeiro. The genesis of the idea may be said to date from 1880, when David Davis, member of Congress for Illinois, initiated an agitation for the establishment of closer commercial relations between the United States and the South American republics. The first practical step of importance was not, however, taken until 1890, when it was resolved by the railway committee of the Pan-American Congress that the whole course of the proposed railway should be surveyed by a staff of competent engineers. Three parties were formed, each being entrusted with a separate section of the work. The first, under Captain Steever, whose place was subsequently taken by Lieut. Macomb, surveyed the route through Central America; the second, under Mr. W. F. Shunk, that between Costa Rica and Quito; and the third, under Mr. W. D. Kelley, the section from Quito to

Cuzco. Work began early in 1891, and was completed in July, 1893, the complete results being published in 1898, in seven volumes. The most important sections are summarized by Prof. Sievers in *Petermanns Mittheilungen* (1900, No. 8). The most valuable results were obtained by the first party, especially as regards the section through Guatemala and El Salvador, where a careful triangulation was carried out, which has supplied a new basis for the mapping of those countries. Valuable information respecting their surface features and structure, with statistics of population, the position and altitude of the volcanoes, and distance from place to place, were also collected. From the frontier of Mexico the proposed route keeps entirely to the Pacific side of Central America, partly because the country is there more open, and partly in order to make use of existing lines of railway. The work of the second section, which had to do with a more difficult country, was somewhat less detailed, but though of less scientific value, is of interest as supplying varied information on some of the least-known parts of the Cordillera. After coasting the gulf of Panama, the line strikes south-east across the basin of the Atrato to Antioquia, on the Cauca, the valley of which river is then followed to its head. A subsidiary line from Cartagena to the Cauca valley was also surveyed, the first half leading over plains of less than 1500 feet in elevation. In the Cauca valley, which is regarded as the bed of an old lake, comparatively few difficulties are encountered, though three bridges over the river are necessary. Throughout the region of the Cordillera the line of course runs at a high elevation, frequently crossing passes of 10,000 to 14,000 feet in height. North of Quito the greatest difficulties are encountered between Pasto and San Pablo, where the mountains are grooved with deep cañons. Between Quito and Cuzco the ground is still more unfavourable, and no fewer than one hundred tunnels are necessary, especially in the southern section, where the ascents and descents are often abrupt. As a rule, the line chosen follows the ridges rather than the valleys, keeping, *e.g.*, generally well above the valley of the Marañon, though descending in it at one point to 2600 feet. The greatest elevation, 15,000 feet, is reached just before Cerro de Pasco. Prof. Sievers thinks that the project is likely to be carried out at no distant date, at least as far as the Cordillera railway is concerned. This can easily be connected with the lines of Southern Peru and Chile, but its extension across the Chaco to Brazil and Argentina must be relegated to a more distant future.

Delimitation of the British Guiana Boundary.—The Commissioners appointed by the British and Venezuelan Governments to delimit on the spot the boundary fixed by the Paris arbitration tribunal, have lately entered upon their labours. Beginning from Point Plaza on the coast, they will fix the boundary round the west and south of British Guiana as far as the frontier of the Dutch colony, without prejudice, however, to the claims of Brazil in the south. The British Commissioners, headed by Mr. M. McTurk, number four, and those representing Venezuela eight, and it is expected that the work will occupy a year.

The Franco-Brazilian Boundary.—The award of the President of the Swiss Federal Council, given on December 2, settles at last a frontier question which has been a subject of dispute between the countries interested for considerably over a century. The uncertainty regarding the boundary rested on an ambiguity in the treaty of Utrecht (1713), which, in the eighth article, laid down that the two colonies should be separated by the river Japoc, or Vincent Pinzon. From the wording of the rest of the article, which assigned to Portugal the navigation of the Amazon and the possession of both banks of the river, the French champions claimed that the Vincent Pinzon river must lie immediately north of the Amazon mouth, and that it was in fact the Araquari, which, by its northern mouth, enters a bay which has been known as that of Vincent Pinzon. The Brazilian claimed

that the river intended was the Oyapok, and this has been substantiated by the decision of the arbitrator. The new boundary runs from the mouth to the source of this river, afterwards following the water-parting formed by the Tumuc-Humac mountains to the frontier of Dutch Guiana. In this part it follows an intermediate line between the extreme French and Brazilian claims, though much nearer the latter than the former. According to the extreme French claim, a band of territory from the Atlantic to the Rio Branco would have been added to the French colony. The whole question has been dealt with in a variety of French publications, among others in the *Bulletin* of the Geographical Society of Languedoc for 1895, and in the *Tour du Monde* for 1899 (pp. 589-600). The latter contains an account by M. Brousseau of the geography and resources of the contested territory, the principal importance of which has consisted in the existence of gold deposits.

Proposed Expedition through Southern Brazil. We learn from *Petermanns Mitteilungen* that an extensive journey of exploration, which, if successful, should do much to improve our knowledge of some of the least known parts of south America, is projected by R. S. Lachnit and A. Soffner of São Paulo. The journey is to be divided into three sections, and it is hoped that a start on the first of these will be made in March, 1901. It is proposed to proceed first from São Paulo to the Rio Aquapehy, to follow the latter to its junction with the Parana, and thence to cross the plateau of Mato Grosso to Cuyaba. The second section of the expedition will be devoted to the exploration of the headwaters of the Paraguay and the descent to its mouth of the Jamarý, a tributary of the Madeira. Lastly, it is proposed to strike across the forest region between the Madeira and Purus, reaching the latter river at Labrea, and crossing the basins of the Jurua and Jutaby to Tabatinga on the Amazon.

Discovery of the Bariloche Pass.—Notes in *Globus* (vol. 78, p. 182) and *Petermanns Mitteilungen* (1900, p. 218) announce the recent discovery of the 'Baños' and the Bariloche or Vuriloche pass, so often referred to in the narrative of the Franciscan Padre Menendez, the latter as affording an easy route from Southern Chile to Lake Nahuel-huapi and the mission there established more than a hundred years ago. In spite of careful search, both by Chilean and Argentine explorers, this pass could not for long be found. Its rediscoverer is the Chilean Captain Barrios, who seems to have been put on the right track by the recent edition of Menendez' narrative brought out by Dr. Fonck. Passing from the Rio Valverde to the valley of the Rio Esperanza, Captain Barrios ascended the Rio Branco to the neighbourhood of the Tronador (from the glaciers of which it takes its rise), and here he came upon the warm springs of the Franciscan Father. Following up a tributary of the Rio Branco to the east, he found a broad and easy pass to the south-east of the Tronador, which led him to the Rio de los Nadis and the Lago Mascardi, and eventually without difficulty to Nahuel-huapi. Traces of former use of the route were found both on the Rio Branco and on Lago Mascardi.

AUSTRALASIA AND OCEANIC ISLANDS.

Re-emergence of Falcon Island.—It was ascertained during a recent voyage of H.M.S. *Porpoise*, that Falcon island, the small island lying south-west of the Tonga group, which first appeared in 1885 as the result of a volcanic eruption, but disappeared again in 1898, has again emerged from the sea, causing great danger to navigation. The present contour of the island is likened to a gigantic whale-back. A description of the island as it appeared in 1889 is to be found in the *Proceedings R.G.S.*, 1890, p. 157.

Trade of the Cook Islands.—The report on the trade of the Cook islands for 1899 records a decrease in the exports for the past two years solely due to partial

failure in the orange and coffee crops, the staple articles of produce in these islands. Both coconuts and bananas are being planted in large quantities, and there is a prospect that the future trade of these islands with New Zealand will be largely increased. The coffee crop of last year proved almost a failure, owing to the trees being attacked by the Ceylon leaf blight; this will doubtless seriously affect the export of coffee from Rarotonga for several years to come. The blight has not reached the islands of Mangaia or Aitutaki, but these islands produce but a small amount as compared with that of Rarotonga. It is hoped that copra will, to some extent, take the place of this important item of export, coconut-planting is therefore encouraged. A large orange crop is anticipated for the present year. Under present conditions Rarotonga and Aitutaki are the only islands of the group favourably situated for the purposes of trade, for they alone are said to be frequently visited by the Union Company's steamer, probably for the reason that they have good boat passages through the reef; whereas the fertile islands of Mauke, Atiu, and Mangaia have not these advantages, and are completely out of the ordinary course of trade. The production of copra appears to be the only industry left to the three islands. It is suggested that the traders and Maoris shall combine to purchase a large oil-engine schooner, that shall not only pay regular visits to the outlying islands, but shall also take occasional cargoes to New Zealand, and that such a schooner might be subsidised. As already announced in the *Journal*, the Cook islands have recently been annexed to Great Britain.

POLAR REGIONS.

A Canadian Arctic Expedition.—At the meeting of the Society on November 26, the President said: "In talking of the arctic regions, I am glad to be able to announce to you that there is to be a serious attempt to reach the north pole by an enterprising Canadian, Captain Bernier, who has very carefully considered what Dr. Nansen did, and has determined to work on the same principle; by entering the ice a good deal nearer Behring straits, he thinks he will be able to float right across the north pole and come out in the East Greenland drift. I understand he will be encouraged and helped by the Canadian Government. He comes with introductions from Lord Minto to myself, Mr. Chamberlain, and others, and I have no doubt the Society will give him all the encouragement that is possible, and I sincerely trust he may succeed."

News of Peary.—Letters from Peary have at last been received in America, giving some account of the traveller's plans and prospects at the beginning of last spring, though nothing is as yet known of his experiences during the summer months. At the end of March, he wrote from Fort Conger to the effect that his whole expedition had been successfully transferred to his northern base, from which he was ready to set out northwards with ample supplies in prosecution of the main object of his journey—the attempt on the north pole. If unsuccessful in 1900, he was prepared to renew the attempt during the present year. It is hoped that the *Windward* reached Peary's headquarters before the close of last season.

GENERAL.

The "Mile" of the Mediæval Italian Charts.—In a pamphlet reprinted from the *Nachrichten* of the Scientific Society of Göttingen, Dr. H. Wagner recurs to the question of the scale of miles employed in the Italian nautical charts of the Middle Ages, to which he called attention in 1895, in a paper read at the London meeting of the International Geographical Congress. Dr. Wagner entirely dissents from the explanation of the scale in question suggested by Baron von Norden-skiöld in his *Periplus* and elsewhere. The latter writer based his idea that the Italian charts were primarily of Catalan origin, on the discovery of a Spanish

league, which seemed to have supplied the basis for the scale employed in them. Dr. Wagner contends that this theory is based on an insufficient foundation, the first mention of the Spanish league referred to occurring as late as 1611, in J. Mariana's work, "De Ponderibus et Mensuris;" while he shows that the unit employed in the Italian charts is always the *mile* of $1\frac{1}{2}$ to $1\frac{1}{4}$ kilometres. While searching for evidence of the use of such a mile (shorter than the common or Roman mile) at the time of the charts in question, Dr. Wagner lighted upon a reference, in Fernel's 'Monalosphærium' of 1526, to a "geometric foot," bearing just the same relation to the Roman foot as the nautical mile of the charts does to the Roman mile. This relation is not only to be derived from a measurement of the foot as drawn by Fernel, but from his express statement in his 'Cosmotheoria' (1528) that the Roman mile contains 1000 common paces, or 1200 geometric paces. Fernel quotes, in support of his statement, the mathematician Campanus, whose 'Tractatus de Sphæra Solida' is dated 1303, or just the time at which the first charts of the Mediterranean appeared. In the concluding section of his paper, Dr. Wagner seeks to account for the use at sea of a shorter mile than that in ordinary use by the smaller distance traversed, as a rule, by a ship sailing along a coast, as compared with that involved by a land journey between the same points; quoting in illustration the statement of Polybius, that the distance along the southern coast of Italy—3000 stadia by land—is 500 stadia less in the case of one making the journey by sea.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Second Ordinary Meeting, November 26, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS.—*Thos. Evelyn Leslie Alldridge; John Laurence Baird; Josiah Baker; Captain Jus. Edgar Ballantine; Major Geo. Henry Barefoot, R.A.M. Corps; Wm. Maxwell Battersby, J.P.; Louis Charles Bernacchi; Edwyn Bevan, M.A.; Herbert L. Bridgman; Rev. Joseph Bryant; William Buckley; Herbert Thomas Burls; Eggleston Burrows; P. C. Chesnaye; William Colbeck, R.N.R.; Claude Forlong Condell; Oscar Terry Crosby; Edmund Davis; Ernest Ritson Dewsnap; Kingsley Dunbar-Anderson; George Fenwick; Percival Clennell Fenwick, M.B.; John Fleuret; James Frank Fowler; Sir Keith Alexander Fraser, Bart.; Ernest Profullanun Ghosh; Johnson Simpson Greenhalgh; Major A. B. Hamilton, King's Own Scottish Borderers; John M. Hanbury; Charles William Hill; Major Joseph Hüneberg, Army Head Quarter Staff; Chas. Frederick Hunter; John F. Kane; Alfred Joseph Kennedy; Major-General Henry Herbert Lee, R.E., J.P.; Henry G. A. Leveson; Ernest Ward Lowry; Dumaresq Williamson Manning; Rev. Edwin Ernest Marshall; Philip Michelmores, M.A.; Frederick Marius Modera; Captain Arthur Byssie Molesworth, West African Frontier Force; Charles Ernest Morrison; Nrishinha Chandra Mukherzi, M.A., B.L.; Hon. A. Murray, M.P.; William Charles Henry Napier; Captain Fraser Newall, Argyll and Sutherland Highlanders; Earl Percy, M.P.; Charles Harold Perrott, B.A.; T. F. Perrott; Lieut. Chas. Wm. Rawson Royle, R.N.; Major G. Morley Saunders 2nd Durham Light Infan'ty; Hugh Stowell Scott; William Sharp; Chas. Telford Smith; Lieut.-Colonel Brisbane Warren Somerville-Large, R.A.M.C., F.R.C.S.E.; Captain F. S. Stewart, 45th Sikhs; Bryan Stapleton; Alf. Haswell*

82 MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Straker; Chas. Herbert Thorpe; C. Braithwaite Wallis; Daniel Wm. Wheeler, M.A.; Wm. FitzHugh Whitehouse; Major Ernest Berdoe Wilkinson, Lincolnshire Regiment; Leonard Winder.

HONORARY CORRESPONDING MEMBER.

Dr. Hjort (Head of the Norwegian Government Fishery Board).

The Paper read was :—

“Expedition to Lake Tanganyika and the Countries North of it.” By J. E. S. Moore, Esq.

THE HALL OF MEETING.

The President said: I have received two or three letters complaining of the intense cold of this place. Of course, if anybody feels it more than another, it is those on the platform, where we have an arctic blast down the backs of our necks. The theatre now belongs to Her Majesty's Government, and the fact is we have only a precarious position here. Permission to hold our meetings here is only granted until March next, although it is probable we shall be allowed to remain until the end of the session. The building is no longer lent to us by that liberal institution, the University of London, but by H.M. Treasury. I have thought of various means of preventing a draught, and I hope I shall be able to mitigate your sufferings to a certain extent.

Third Ordinary Meeting, December 10, 1900.—Sir CLEMENTS MARKHAM, K.C.B., President, in the Chair.

ELECTIONS :—*Stephen S. Bagge; Dr. Vaughan Bateson; Frederick Charles Bridges; Hon. Willoughby Burrell; Malcolm Fergusson; Philip James Grierson, B.A.; Edward Macbean; Henry Magill; George Marshall; Frederick Jesse C. Poole; Charles H. Sanford; John Arthur Smallbones; Arthur March Tapp; Colonel W. J. Tatham, R.A. (retired); Carlos Butler Wilson.*

HONORARY CORRESPONDING MEMBER.

Dr. Van Drygalski (Leader of the German Antarctic Expedition).

THE ANTARCTIC FUND.

The President said: I have to commence with a communication connected with the Antarctic Fund. You will remember our Society headed the list of subscribers with £5000. The Government grant was conditional on our raising £45,000. Then our Council came forward and guaranteed the additional £3000 required. The Council has now decided that instead of the £3000 being a lien on the fund, it shall be part of the subscription to the fund, increasing our subscription to the very large sum of £8000. This reminds me of the splendid days of the Speke, Burton, and Livingstone expeditions. We now only have to increase the fund as much as we possibly can, for more money is very urgently needed.

DEATH OF THE HON. DAVID CARNEGIE.

It is with deep regret that I have to allude to the death of our friend, Mr. Carnegie. The news of his death arrived a day or two ago; he was serving under General Lugard in Nigeria, and I am sure the meeting will wish me to express its deep sympathy with the family of Mr. Carnegie at this most mournful loss.

The Paper read was—

“Expedition to the Barotse Country, and through Africa to the Nile.” By Major St. Hill Gibbons.

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
 Abh. = Abhandlungen.
 Ann. = Annals, Annales, Annalen.
 B. = Bulletin, Bollettino, Boletim.
 Com. = Commerce.
 C. Rd. = Comptes Rendus.
 Erdk. = Erdkunde.
 G. = Geography, Geographie, Geografia.
 Ges. = Gesellschaft.
 I. = Institute, Institution.
 Iz. = Izvestiya.
 J. = Journal.
 k. u. k. = kaiserlich und königlich.
 M. = Mitteilungen.

Mag. = Magazine.
 Mem. = Memoirs, Mémoires.
 Met. = Meteorological.
 P. = Proceedings.
 R. = Royal.
 Rev. = Review, Revue.
 S. = Society, Société, Selskab.
 Sitzb. = Sitzungsbericht.
 T. = Transactions.
 V. = Verein.
 Verh. = Verhandlungen.
 W. = Wissenschaft, and compounds.
 Z. = Zeitschrift.
 Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Globus* 78 (1900): 153-157. **Hedinger.**
 Handelsstrassen über die Alpen in vor- und frühgeschichtlicher Zeit. Von A. Hedinger. *With Map.*

Austria. **Penck.**
 Die Tiefen des Hallstätter- und Gmundenersees. Von Albrecht Penck. Wien, 1898. Size 7 × 5, pp. 16. *Presented by the Author.*

Austria—Bohemia. *Globus* 78 (1900): 101-106. **Zemmrigh.**
 Die Zustände an der Sprachgrenze in Nordwestböhmen. Von Dr. J. Zemmrigh. *With Map.*

A study of the border-line between the German and the Czech speakers in Bohemia. The zone of mixed languages is narrow, and in many districts not 10 per cent. of the alien language is found on either side beyond the linguistic frontier.

Austria—Bosnia and Herzegovina. *M.G. Ges. Wien* 43 (1900): 181-193. **Heiderich.**
 Die Landwirthschaft in Bosnien und der Hercegovina. Von Prof. Dr. Franz Heiderich.

Austria—Hungary. *Spelunca* 6 (1900): 13-15. **Siegmeth.**
 La source intermittente de Kalugyer. Par Charles Siegmeth.

Austria—Hungary. *Globus* 78 (1900): 257-263. **Birkner.**
 Herkunft der magyarischen Fischerei. Von Dr. F. Birkner. *With Illustrations.*

Summarizes Dr. Janko's researches on the origin of fishing in Hungary, published as vol. i. of the results of Count Zichy's third exploring journey in Asia. From a study of the distribution and nomenclature of the principal economic fishes of Hungary, Dr. Janko comes to the conclusion that the original home of the Magyars was between the rivers Volga, Ural, and Kama.

Austria—Meteorology. *Meteorolog. Z.* 17 (1900): 437-448. **Satke.**
 Wolkengeschwindigkeit und -Richtung nach dreijährigen Beobachtungen in Tarnopol. Von Ladislaus Satke.

Austria—Poland.

Akademia Umiejetności w Krakowie. Sprawozdanie Komisji Fizyograficznej, Tom. xxxiv. w Krakowie, 1899. Size 9½ × 6, pp. xxxii., 208, 210, and 68. *Map. Presented by the Academy.*

- Balkan Peninsula.** *Globus* 78 (1900): 159-164, 173-178. **Penck.**
 Die Eiszeit auf der Balkanhalbinsel. Von Albrecht Penck. *With Illustrations.*
 A *résumé* of our knowledge of glacial phenomena in the Balkans, especially as derived from the researches of Dr. Cvijić, with additions from the writer's personal observations in 1899.
- Balkan Peninsula.** *Mém. S.G. Genève* 39 (1900): 11-24. **Cvijić.**
 La forme de la péninsule des Balkans. Par J. Cvijić.
 On the essential features of the coast-lines and mountain systems of the Balkan peninsula.
- Balkan Peninsula.** *Globus* 78 (1900): 133-136. **Penck.**
 Die Eiszeit auf der Balkanhalbinsel. Von Albrecht Penck.
- Danube.** **Penck.**
 Thalgeschichte der obersten Donau. Von Prof. Albrecht Penck. Sonderabdruck aus dem 28 Hefte der Schriften des "Vereines für Geschichte des Bodensees und seiner Umgebung." Size 10 × 7½, pp. 14. *Presented by the Author.*
- Europe—Historical.** **Westberg.**
B.A. Imp. Sci. St. Petersburg 11 (1899): 211-245, 275-314.
 Beiträge zur Klärung orientalischer Quellen über Osteuropa. Von Friedrich Westberg.
 On the earliest sources of information as to the condition of Eastern Europe.
- Faroe Islands.** *Meteorolog. Z.* 17 (1900): 470-473. **Knudsen.**
 Der Einfluss des ostisländischen Polarstromes auf das Klima der Faröer. Von Martin Knudsen.
- France.** *C. Rd.* 131 (1900): 554-556. **Mathias.**
 Sur la distribution de la composante horizontale du magnétisme terrestre en France. Note de M. E. Mathias.
- France—Colonization.** *Questions Dipl. et Colon.* 10 (1900): 129-141. **Masson.**
 Marseille et la colonization française. Par M. le Prof. Paul Masson.
- France—Dunkirk.** *B. Union G. Nord de la France* 20 (1899): 289-292. **Terquem.**
 Ce qu'a coûté le Port de Dunkerque, ce qu'il rapporte. Par M. Henri Terquem.
 On the recent development of the trade of Dunkirk.
- France—Gard.** *Spelunca* 6 (1900): 31-39. **Mazauric.**
 Les cataractes du Santadet (Gard). Par M. F. Mazauric. *With Plans.*
- France—Garonne.** *A travers le Monde, Tour du Monde* 6 (1900): 365-366. **—**
 La mise en état de navigabilité de la Garonne. *With Map.*
 On the proposed improvement of the Garonne as a waterway.
- France—Hérault.** **—**
 Géographie générale du Département de l'Hérault publié par la Société Languedocienne de Géographie. Tome Premier—Fascicule Annexe, 1895 (pp. iv. and 192); Tome Deuxième—i. Flore., ii. Faune. Montpellier, 1899. Size 10 × 6½, pp. 372. *Maps and Illustrations.*
 The first volume of this treatise was noticed in the *Journal* for 1897 (vol. ix. p. 231) The supplementary part, issued later, contains a sketch of the geological formations represented in the department of Hérault, with a note on the changes to which the region of the Rhine delta has been subject within historic times. The second volume deals with the Flora and Fauna, the former being treated in relation to existing physical conditions as well as to the changes introduced by man.
- France—Jura.** *Spelunca* 6 (1900): 26-31. **Fournier.**
 Recherches spéléologiques dans le Jura Franc-comtois. Par M. E. Fournier.
- France—Jura.** *Mém. S. Spéologie*, No. 24 (1900): pp. 46. **Fournier and Magnin.**
 Recherches spéléologiques dans le Jura. Par MM. Fournier and Magnin. (2^e Campagne 1899-1900.) *With Plans and Illustrations.*
- France—Pyrenees.** *Spelunca* 6 (1900): 19-25. **Briet.**
 La grotte de Churugues, Vallée de Barèges (H^{tes}-Pyrénées). Par Lucien Briet. *Plan.*
- France—Seine.** **Babinet and Lemoine.**
 Ponts et Chaussées. Service hydrométrique du Bassin de la Seine. *Résumé des*

Industry, and Art; and the History of Social Institutions and of Moral and

· Religious Ideas.

These various branches of study will be treated more fully, in proportion as they are less adequately provided for in existing periodicals. Classical Philology and Antiquities, for example, and the History of European Civilisation, which have recognised organs of their own already, will be treated only from the strictly anthropological standpoint; and, conversely, prominence will be given to those other studies, such as Prehistoric Archaeology, and the History of Non-European Cultures, which (in this country, at all events) have not hitherto had a periodical record of their own. Special note will be taken, throughout, of those investigations which deal with the origins and the earlier stages of those forms of civilization which have eventually become dominant, and of the races among which they have arisen and developed.

Each number of **MAN** will consist of 16 imperial 8vo. pages (the size, paper, and size of type of this Prospectus), with occasional illustrations in the text; together with one full-page plate.

~~Man. Review~~ *Globe* 78 (1900): 159-164. 173-178.

~~Panek~~

[*Supplement to GEOGRAPHICAL JOURNAL, January 1901.*

MAN

A MONTHLY RECORD OF ANTHROPOLOGICAL SCIENCE.
TO BE PUBLISHED UNDER THE DIRECTION OF
THE ANTHROPOLOGICAL INSTITUTE OF GREAT BRITAIN AND IRELAND.



3, HANOVER SQUARE, LONDON, W.,

December 1900.

THE Council of the Anthropological Institute proposes to establish, under the above title, a Monthly Record of progress in the various branches of the Study of Man.

observations centralisées . . . pendant l'année 1898. Par M. Babinet. Versailles, 1899. Size $10\frac{1}{2} \times 7$, pp. 52.

Observations sur les Cours d'Eau et la Pluie centralisées pendant l'année 1898. . . . Par M. G. Lemoine et M. Babinet. [7 Plates.] Size 17×11 .

France—South Coast.

Bourelly.

Les Perles de la Côte d'Azur. La Rivière du Cap Roux au Torrent Saint-Louis. Monaco, Monte-Carlo, les Routes du Littoral et de la Corniche, Menton et ses Environs. Par le Général Bourelly. Aquarelles et dessins par E. Lessieux. Paris: H. Laurens, 1900. Size $13\frac{1}{2} \times 10$, pp. 412. *Maps and Illustrations.* Price 30s.

On Monaco and Mentone, a descriptive and historical account with numerous illustrations, many of them reproductions in colour of original water-colours.

France—St.-Guilhem-le-Désert. *Tour du Monde* 6 (1900): 517-528.

Gruyer.

Saint-Guilhem-le-Désert. Par M. Paul Gruyer. *With Illustrations.*

Franco-German Boundary. *G.Z.* 6 (1900): 481-503.

François.

Militärgeographische Betrachtungen über das deutsch-französische Grenzgebiet. Von C. von François.

Germany. *Deutsche Rundschau G.* 23 (1900): 55-60.

Jung.

Im Unstrutthal. Von Dr. Emil Jung. *With Illustrations.*

The Unstrut—a small tributary of the Saale—has been of unusual historical interest ever since the time of the Vandals.

Germany. *Globus* 78 (1900): 139-143.

Hansen.

Die deutsche Ostsee- und Nordseeküste. Von R. Hansen. *With Illustrations.*

Notices of two recent books on the German Baltic and North Sea coasts by George Wegener and Hippolyt Haas.

Germany. *G.Z.* 6 (1900): 361-366.

Ihne.

Ueber Abhängigkeit des Frühlungseintritts von der geogr. Breite in Deutschland. Von Prof. Dr. Ihne.

On the dependence of the period of the commencement of spring on the latitude in Germany.

Germany.

Schwabach.

Trade of Germany for the year 1899. Foreign Office, Annual No. 2523, 1900. Size $10 \times 6\frac{1}{2}$, pp. 36. Price 2½d.

Germany—Alsace. *Deutsche Rundschau G.* 22 (1900): 460-464.

Werner.

Das Münsterthal im Ober-Elsass. Von L. G. Werner. *With Illustrations.*

Germany—Prussia. *Globus* 78 (1900): 1-3.

Halbfass.

Der Dratzigsee in Pommern. Von Dr. Halbfass. *With Map and Illustrations.*

The Dratzigsee is a lake in Pommerania of a curious star-like outline. The map shows the depth as deduced from 1280 soundings partly carried out from a boat in summer, partly through the ice in winter. The greatest depth found was 272 feet, the average depth 66 feet.

Germany—Prussia. *Globus* 78 (1900): 185-187.

Wahnschaffe.

Ein geologischer Ausflug in die Lüneburger Heide auf dem Rade. Von Prof. Dr. Wahnschaffe.

On a geological bicycle tour on the Luneberg Heath.

Hungary. *Math. u. Naturw. Berichte Ungarn* 16 (1898): 201-216.

Hegyfoky.

Die Bewölkung in den Ländern der ungarischen Krone. Von J. Hegyfoky.

On the distribution of cloudiness in Hungary.

Hungary—Historical.

Ede.

Horvat Történelmi Repertorium . . . írja Dr. Margalits Ede. Első Kötet. Budapest, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. xxiv. and 784. Price 15 kr.

Malta.

Strickland.

Malta. Report for 1899. Colonial Reports, Annual No. 295, 1900. Size 10×6 , pp. 38. Price 2½d.

Norway. *G.Z.* 6 (1900): 391-393.

Reusch.

Ein Teil des timanschen Gebirgssystems innerhalb Norwegens. Von Dr. H. Reusch. *With Map.*

Russia—Odessa.**Smith.**

Trade of Odessa and District for the year 1899. Foreign Office, Annual No. 2522, 1900. Size $10 \times 6\frac{1}{2}$, pp. 34. *Diagram*. Price 7d.

Sweden—Gothland.*Globus* 78 (1900): 233-235.**Neger.**

Eine Fahrt nach der gotischen Sandinsel (Gotska Sandön). Von Dr. F. W. Neger. *With Illustrations*.

The little-known sandy island here described lies about 25 miles north of Gothland, in the Gulf of Bothnia.

Switzerland.*Mém. S.G. Genève* 39 (1900): 159-168.**Biéler.**

Influence du climat sur le développement des races bovines du Valais. Par S. Biéler.

Switzerland.*C. Rd.* 131 (1900): 566-567.**Meunier.**

Le ravin des Chevalleyres et la régression des torrents. Note de M. Stanislas Meunier.

On a remarkable ravine near Vevey, which is so narrow and deep that it looks like a saw-cut in the mountain.

United Kingdom.

Abstracts of the Returns made to the Board of Trade of Shipping Casualties which occurred on or near the Coasts or in Rivers and Harbours of the United Kingdom from July 1, 1898, to June 30, 1899. Also of the Returns made to the Board of Trade during the year 1898-99 of Shipping Casualties which occurred to British Vessels elsewhere than on or near the coasts or in rivers and harbours of the United Kingdom; and to Foreign Vessels on or near the coasts or in rivers and harbours of British Possessions abroad. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xxx. and 190. *Charts*. Price 4s. 9d.

United Kingdom—England.**Norway.**

Highways and Byways in Yorkshire. By Arthur H. Norway. London: Macmillan and Co., 1899. Size $8 \times 5\frac{1}{2}$, pp. xiv. and 384. *Illustrations*. Price 6s.

United Kingdom—Ireland.**Gwynn.**

Highways and Byways in Donegal and Antrim. By Stephen Gwynn. London: Macmillan and Co., 1899. Size $8 \times 5\frac{1}{2}$, pp. xvi. and 320. *Map and Illustrations*. Price 6s.

ASIA.**Ceylon.***B.S.G. Lille* 34 (1900): 163-170.**Evrard.**

Ceylan. Par le R. P. Évrad, s.j. *With Map*.

The map shows the Roman Catholic dioceses into which Ceylon is divided.

China.*Nineteenth Century* 48 (1900): 557-568.**Blake.**

Notes and Impressions from a Tour in China. By His Excellency Sir Henry Blake, G.C.M.G.

China.*Contemporary Rev.* 78 (1900): 389-396.**Calderon.**

Russian Trade in China. By G. Calderon.

A criticism of the commercial enterprise of Russians in China, with special regard to the overland trade.

China—Canton.**Scott.**

Trade of Canton for the year 1899. Foreign Office, Annual No. 2512, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. Price 1d.

China—Hainan.*P. Zoolog. S.* (1900): 457-504.**Grant.**

On the Birds of Hainan. By W. R. Ogilvie Grant. *With Plates*.

The catalogue of birds is preceded by a condensed diary of the journey of the collector, Mr. John Whitehead, in the Five Finger mountains. Mr. Whitehead left Hong Kong on March 5, 1899, and on March 30 reached the mountains and built a house, where, after collecting birds until May 20, in deplorable conditions as to health, he died on May 24.

China—Hainan.**Madrolle.**

L'Empire de Chine. Hai-Nan et la côte continentale voisine. Par Cl. Madrolle. Paris: A. Challamel, 1900. Size $10 \times 6\frac{1}{2}$, pp. xiv., xviii., and 126. *Maps*. Price 10s.

A solid work giving an ample bibliography, a record of travels, and a clear account of the country which is recognized by the author as the French sphere in China.

China—Kiauchou. *M. Deutsch. u. Oester. Alpenv.* (1900): 161-162.

Die Gebirge des deutschen Kiautschou-Gebietes. *With Map.*

This map is the work of the German Admiralty, and shows on a scale of 1: 75000 the Lau-shan and Tung-liu-shui mountains in the German Kiau-chou district. The highest of these mountains reaches 3770 feet.

China—Kwang-tung. *B.S.G. Com. Saint-Nazaire* 16 (1900): 24-43. **Du Cosquer.**

De la baie d'Along à Quang-Tchéou-Wan en 1899. Par René Du Cosquer. *Map.*

The map shows the bay of Kwang-chau-wan, the site of the concession obtained by the French in 1899 in Southern Kwang-tung.

China—Kweichow. *A travers le Monde, Tour du Monde* 6 (1900): 361-364. **Drahe.**

Kiao-Tchéou. La nouvelle colonie allemande en Chine. Son développement.—Son avenir. Par M. A. Drahe. *With Maps and Illustrations.*

China—Shantung. *Ann. Hydrographie* 28 (1900): 536.

Ankerplatz beim Illis-Friedhof, Südost-Vorgebirge von Schantung.

Note accompanying the chart of an anchorage surveyed by the *Illis* in 1899

China—Trade.

China. Imperial Maritime Customs. 1.—Statistical Series: Nos. 3 and 4, Returns of Trade and Trade Reports for the year 1899. Part ii.—Reports and Statistics for each Port, with Report on Foreign Trade of China. Shanghai; London: P. S. King & Son. 1900. Size 11 × 9, pp. xvi. and 754. *Maps. Presented by the Inspector-General of Chinese Customs.*

Chinese Empire—Mongolia. *B.S.R.G. d'Anvers* 24 (1900): 214-230.

Geluy.

Un voyage en Mongolie. Par le Rév. M. Geluy.

A popular account of Mongolia by the head of the Roman Catholic Missionaries in that province.

Chinese Turkestan—Antiquities.

Klementz and Radloff.

Nachrichten über die von der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg im Jahre 1898 ausgerüstete Expedition nach Turfan. Heft i. St. Petersburg, 1899. Size 12 × 8½, pp. 84. *Map and Illustrations. Presented by the Imperial Academy of Sciences of St. Petersburg.*

The expedition of which the results are here dealt with is that of M. Klementz, alluded to in the *Journal*, vol. xiii. p. 658. The present instalment includes a report on Turfan and its antiquities by M. Klementz himself, and one by Dr. Radloff on the specimens of the old Uigur language discovered by the expedition.

Eastern Asia. *J.R. United Service I.* 44 (1900): 1159-1180.

Schultz.

Russia's Progress in East Asia. By Carl Schultz.

On the advance of Russian influence on the Pacific slope of Asia.

French Indo-China.

Nicolas.

Notices sur l'Indo-Chine, Cochinchine, Cambodge, Annam, Tonkin, Laos, Kouang-Tchéou-Ouan, publiées à l'occasion de l'Exposition Universelle de 1900 sous la direction de M. Pierre Nicolas. Size 9½ × 6½, pp. 320. *Map and Illustrations. Presented by M. Charles Roux.*

The illustrations are numerous, and include some in colours.

French Indo-China—Tonkin.

Dubois.

Robert Dubois. Le Tonkin en 1900. Paris: L. H. May, G. Mantoux, [1900]. Size 13 × 9½, pp. 328. *Map and Illustrations. Price 30s.*

This volume is superbly printed and illustrated, giving a representation of every aspect of native life and work in Tonkin.

India. *Indian Antiquary* 29 (1900): 273-280.

Fleet.

Notes on Indian History and Geography. By J. F. Fleet, PH.D.

Identification of places in the region of the upper Krishna mentioned in a Jain record dating from about 900 A.D.

India—Assam.

Chester.

Progress Report of Forest Administration in the Province of Assam for the year 1898-99. (From July 1, 1898, to June 30, 1899.) By E. G. Chester. Shillong, 1899. Size 13½ × 8½, pp. 88. *Map.*

India—Bombay.

Forrest.

Index to the Selections from the Letters, Despatches, and other State Papers preserved in the Bombay Secretariat. Marátha Series, Volume i. Parts i., ii.,

- and iii., and Home Series, Volumes i. and ii. Edited by G. W. Forrest, B.A. In two parts. Part i.—Index to the Marátha Series. Part ii.—Index to the Home Series. Bombay, 1899. Size 12 x 10, pp. 40 and 80. *Price* 2s. 6d.
- India—Burma.** *Verh. K.A. Wet. Amsterdam* (2 Sec.) 7, No. 2 (1900): 182. **Noetling.**
The Miocene of Burma. By Fritz Noetling, PH.D. *With Map.*
- India—Earthquake.** *Mem. Geolog. Surv. India* 30 (1900): 102. **Oldham.**
List of Aftershocks of the Great Earthquake of June 12, 1897. Compiled by R. D. Oldham.
- India—French Possessions.** **Guy.**
Exposition Universelle 1900. Les Colonies françaises. Notice sur les Établissements français de l'Inde. Par Camille Guy. Paris: Imp. F. Levé, 1900. Size 10 x 6½, pp. 96. *Maps and Illustrations. Presented by M. Charles Rouz.*
Description of Pondicherry, Karikal, Mahé, Yanaon, and Chandernagore, with maps showing the boundaries of the various territories.
- India—Himalaya.** *Alpine J.* 20 (1900): 161-184. **Freshfield.**
Round Kanchinjinga. By Douglas W. Freshfield. *With Map and Illustrations.*
The journey here recorded is referred to in the *Journal*, vol. xv. (1900), p. 642.
- India—Historical.** *J. Asiatic S. Bengal* 69, Pt. i. (1900): 74-92. **Hoey.**
On the Identification of Kusinara, Vaisati, and other places mentioned by the Chinese pilgrims. By W. Hoey. With an edition of a new copper-plate inscription of Jayādityadeva II. By Dr. T. Block.
- India—Meteorology.** *Ann. Hydrographie* 28 (1900): 551-554. **Krebs.**
Luftdruckbeobachtungen in Britisch-Indien und die Theorie der Luftwogen. Von Wilhelm Krebs. *With Diagram.*
On rhythmic fluctuations of atmospheric pressure and their relation to the cold-weather storms of India.
- India—Railways.** **Upcott.**
East India (Railways). Administration Report on the Railways in India for 1899-1900. By F. R. Upcott. London: Eyre & Spottisworde, 1900. Size 13½ x 8½, pp. xxvi., 218, and 1. *Map and Diagrams. Price* 3s. 9d.
The total length of railways open and sanctioned on March 31, 1900, was 26,790 miles, being a net increase of 730½ miles during the year. The map distinguishes the various gauges employed, and, in the case of standard and metre gauges, the double from the single lines.
- India—Tide-Tables.** **Crosthwait and Roberts.**
Tide-tables for the Indian Ports for the year 1901 (also January, 1902). Part i.—Western Ports (Suez to Pámban Pass). Part ii.—Eastern and Burma Ports (Galle to Port Blair). By Lieut. H. L. Crosthwait and E. Roberts. Size 6½ x 4½, pp. 1204.
- India and Afghanistan.** **Aristoff.**
N. A. Aristoff. The Anglo-Indian "Caucasus." English collisions with the Afghan frontier tribes. An Ethno-historical and political Study. [In Russian.] St. Petersburg, 1900. Size 11 x 7½, pp. 198. *Presented by the Author.*
- Indo-China.** *Queensland G.J.* 15 (1899-1900): 1-18. **Lamington.**
A Journey in Indo-China. By His Excellency Right Hon. Lord Lamington.
Refers to the journey described before the Royal Geographical Society in 1891.
- Japan.** *Deutsche Rundschau G.* 23 (1900): 62-68. **Diósy.**
Mein Besuch in Japan. Von Arthur Diósy.
Authorized extract from an address delivered in 1899 before the Japanese Society of London, by its founder.
- Japan.** **Hitomi.**
Dai-Nippon. Le Japon. Essai sur les Mœurs et les Institutions. Par I. Hitomi. Paris: Librairie de la Société du Recueil Général des Lois et des Arrêts, 1900. Size 9½ x 6½, pp. 306. *Illustrations. Price* 15 fr.
The beautiful illustrations of this book in themselves confer a high value upon it. The author and the artists are natives of the country they describe.
- Japan—Earthquakes.**
Publications of the Earthquake Investigation Committee in Foreign Languages. No. 3. Tokyo, 1900. Size 10 x 7½, pp. vi. and 104. *Plates.*

- Japan—Formosa.** *B.S. d'Études Colon.* 7 (1900): 757-778. **Fischer.**
 Formose. D'après M. Fischer. *With Illustrations.*
 Based upon a book lately published by a German traveller.
- Japan—Formosa.** *Petermanns M.* 46 (1900): 221-234. **Yamasaki.**
 Unsere geographischen Kenntnisse von der Insel Taiwan (Formosa). Von Dr. N. Yamasaki. *With Map. Also separate copy presented by the Author.*
 A sketch of the physical geography of the island based in great part on the writer's own observations. The map is on the scale of 1 : 1,000,000.
- Japan—Formosa.** **Layard.**
 Trade of North Formosa for the year 1899. Foreign Office, Annual No. 2525, 1900. Size 10 × 6½, pp. 16. Price 1d.
- Japan—Fujiyama.** *Queensland G.J.* 15 (1899-1900): 55-66. **Thistlethwayte.**
 Round Fuji to the Ice Caves. By D. S. Thistlethwayte.
 Account of a journey made in 1899, with notes on the volcanic history of Fuji.
- Japan—Pescadores.** *J. College Sci. Imp. University Tōkyō* 13 (1900): 1-57. **Kotō.**
 Notes on the Geology of the Dependent Isles of Taiwan. By B. Kotō, PH.D. *With Plates.*
 On the geology of the Hoko group of the Pescadores, which, as dependencies of Taiwan (Formosa), are now Japanese territory.
- Korea.** **Jordan.**
 Trade of Corea for the year 1899. Foreign Office, Annual No. 2511, 1900. Size 10 × 6½, pp. 32. Price 2d.
- Malay Archipelago—Banka.** **Zondervan.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 519-527.
 Bijdrage tot de kennis der eilanden Bangka en Blitong. Door H. Zondervan.
- Malay Archipelago—Borneo.** **Nieuwenhuis.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 411-435.
 Tweede reis van Pontianak naar Samarinda in 1898 en 1899. Door Dr. A. W. Nieuwenhuis. *With Illustration.*
- Malay Archipelago—Celebes.** **Kruijt.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 436-466.
 Het Rijk Mori. Door Alb. C. Kruijt. *With Map.*
 Information respecting the kingdom of Mori collected during a visit to Celebes in 1899; the kingdom borders the Gulf of Mori (usually called Tomori).
- Malay Peninsula.** *J. Asiatic S. Bengal* 69, Pt. ii. (1900): 1-87. **King.**
 Materials for a Flora of the Malayan Peninsula. By Sir George King, K.C.I.E.
- Philippine Islands.** **Coronas.**
 Observatorio de Manila. La actividad sísmica en el Archipiélago Filipino durante el año 1897. Por el P. José Coronas, S.J. Manila, 1899. Size 10½ × 7½, pp. 138. *Maps and Diagrams.*
 A series of reports on the earthquakes experienced in the Philippines in 1897, with maps showing the distribution and intensity of each, together with seismograph tracings.
- Russia—Siberia.** *B.A. Imp. Sci. St.-Petersbourg* 11 (1899): 9-27. **Abels.**
 Erdmagnetische Beobachtungen in Obdorsk und Ssamarowo. Von H. Abels. *With Plans.*
- Russia—Siberia.** **Schrenck and Grube.**
 Reisen und Forschungen im Amur-Lande in den Jahren 1854-1856 im Auftrage der Kaiserlichen Akademie der Wissenschaften zu St. Petersburg ausgeführt und in Verbindung mit mehreren Gelehrten herausgegeben von Dr. Leopold v. Schrenck. Anhang zum III. Bande. Zweite Lieferung. Linguistische Ergebnisse. Bearbeitet von Dr. Wilhelm Grube. II. Goldisch—Deutsches Wörterverzeichnis. St. Petersburg, 1900. Size 13½ × 10, pp. x. and 150. *Presented by the Imperial Academy of Sciences of St. Petersburg.*
- Siam—Chiengmai.** **Black.**
 Trade of Chiengmai for the year 1899. Foreign Office, Annual No. 2518, 1900. Size 10 × 6½, pp. 14. Price 1d.

Turkey—Asia Minor. *Globus* 77 (1900): 377-383. **Vincenz.**
 Reise nach den Steinkaskaden von Hierapolis (Kleinasien). Von Friedrich v. Vincenz. *With Illustrations.*

Description and photograph of a remarkable "waterfall," in which a small stream, very rich in carbonate of lime, has deposited so thick a calcareous coating that it forms a veritable stone-cascade.

Turkey—Palestine. *Mém. S.G. Genève* 39 (1900): 25-157. **Gautier.**
 Autour de la mer Morte. Par Lucien Gautier. *With Map and Illustrations.*

This journey, not the author's first visit to the Dead sea, took place in the spring of 1899. The illustrations are numerous, and refer in large measure to the ancient buildings. As an appendix, the author gives the French original of his article on the Dead sea in Black's new *Encyclopædia Biblica*.

Turkey—Palestine. *Palestine Exploration Fund, Quarterly Statement* (1900): 342-350. **Welch.**
 The Influence of the Ægean Civilization on South Palestine. By F. B. Welch.

The historical inferences with which this paper deals are drawn from a consideration of the ancient pottery found in Palestine.

AFRICA.

Abyssinia. *Trade of Adis Abbaba and Harrar for the Year 1899-1900.* Foreign Office, Annual No. 2531, 1900. Size 9½ × 6½, pp. 26. *Map. Price 6d.* **Baird.**
 See note, *ante*, p. 75.

Abyssinia. *Jahresb. G.-Ethnogr. Ges. Zürich* (1899-1900): 35-59. **Ilg.**
 Über die Verkehrsentwicklung in Äthiopien. Vortrag von Alfred Ilg.
 On recent attempts to open up commercial intercourse with Abyssinia.

Algeria. *Questions Dipl. et Colon.* 10 (1900): 193-211; 281-292. **Mandeville and Demontès.**
 Études de démographie algérienne. Les populations européennes: leur accroissement, leur densité et leurs origines. Par MM. G. Mandeville et V. Demontès.

Cape Colony. *Statistical Register of the Colony of the Cape of Good Hope for the year 1899, with Supplement for March Quarter, 1900.* Cape Town, 1900. Size 13 × 8½, pp. xvi. and 347. *Diagrams. Presented by the Agent-General for the Cape of Good Hope.*
 Contains a large amount of detailed information on trade, industries, railways, etc.

Congo State—Katanga. *Mouvement G.* 17 (1900): 505-509. **Wauters.**
 L'Expédition Lemaire au Katanga. Par M. A. J. Wauters. *Portrait and Map.*
 A note on this appears in the *Journal*, vol. xvi. p. 684.

Egypt. *The Emerald Mines of Northern Etbai.* By Donald A. MacAlister. (From the *Geogr. Jour.*, November, 1900.) Size 10 × 6½, pp. 14. *Maps and Illustrations.* **MacAlister.**

Egypt and the Sudan. *England, Egypt, and the Sudan.* By H. D. Traill, D.C.L. London: A. Constable & Co., 1900. Size 9½ × 6, pp. 242. *Map. Price 12s. Presented by the Publishers.* **Traill.**
 A clear summary of recent Egyptian History, beginning with a brief account of the establishment of the Khedivate. The concluding chapter gives a forcible but dispassionate statement of the reasons which have compelled the continuance of the occupation by Great Britain.

Egyptian Sudan—"Sudd." *Permanent Removal of the White Nile "Sudds" and Reclamation of the "Sudd" Region.* By W. Willcocks. 1899. Size 11 × 9, pp. 5. (Typewritten.) *Presented by the Author.* **Willcocks.**

French Congo. *Notice sur le Congo Français, rédigée sous la direction de M. Marcel Guillemot.* Paris: J. André, 1900. Size 9½ × 6, pp. 160. *Map and Illustrations. Presented by M. Charles Roux.* **Guillemot.**

French Congo. *La G., B.S.G. Paris* (1900): 343-350. **Jobit.**

Le cours inférieur de la Likouala aux Herbes. Par E. Jobit. *With Map.*

See note, *ante*, p. 73.

French Guinea. **Famechon.**

Notice sur la Guinée Française, par M. Famechon, publiée à l'occasion de l'Exposition Universelle. [1900.] Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 230. *Map and Illustrations.* Presented by M. Charles Roux.

The author claims French Guinea, and especially the town of Conakry founded in 1890, as a refutation of the vague "Anglo-Saxon charge" that the French people have no longer the power to create colonies. The progress recorded here bears out his case.

French Somali Coast. **Vignéras.**

Notice sur la côte Française des Somalis. Par Sylvain Vignéras. (Exposition Universelle de 1900.) Paris: Imp. Paul Dupont, 1900. Size $9\frac{1}{2} \times 6$, pp. 88. *Map and Illustrations.* Presented by M. Charles Roux.

French Sudan.

Exposition Universelle de 1900. Les Colonies Françaises. Sénégal-Soudan, Agriculture, Industrie, Commerce. Paris: A. Challamel, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 124. Presented by M. Charles Roux.

French West Africa—Ivory Coast. *Deutsche G. Blätter* 23 (1900): 229-257. **Friedrich.**
Die französische Kolonie Côte d'Ivoire. Eine wirtschaftsgeographische Studie. Von Ernst Friedrich.

A careful piece of work, based on the most recent information. The writer is inclined to take a hopeful view of the future of the colony.

French West Africa—Timbuktu. *B.S.G. Marseille* 24 (1900): 172-192. **Imbert.**

La Région de Tombouctou. Par le Commandant Imbert.

German East Africa. **Dundas.**

German East Africa, 1892-1899. Foreign Office, Miscellaneous, No. 535, 1900. Size $10 \times 6\frac{1}{2}$, pp. 52. Price 3d.

This consular report forms a compact handbook of the geography and the present economic condition of German East Africa.

German East Africa. *Verh. Ges. Erdk. Berlin* 27 (1900): 371-384. **Fülleborn.**

Herr Stabsarzt Dr. F. Fülleborn: Über seine Reisen im Nyassa-Gebiet.

This journey in the Lake Nyasa region is referred to in the *Journal* for November, p. 561.

German East Africa. *G.Z.* 6 (1900): 449-459. **Stromer.**

Zur Geographie Deutsch-Ostafrikas. Von Dr. Ernst Stromer.

On the geology and configuration of German East Africa.

German East Africa. *La G., B.S.G. Paris* (1900): 351-355. **Chesneau.**

L'expédition du Pendule. Par M. Chesneau.

On the German pendulum expedition referred to in the *Journal*, vol. xvi. p. 352.

German South-West Africa. *Deutsch. Kolonialblatt* 11 (1900): 830-833. **Watermeyer.**

Bericht über eine Reise nach dem Norden des Schutzgebietes.

German West Africa—Kamerun. **Von Lüdinghausen.**

Deutsch. Kolonialblatt 11 (1900): 749-752.

Bericht über die Expedition und das Gefecht bei Segawo.

Account of an expedition from the German station on the Ngoko for the settlement of a feud between the Bangandus and the Nzimus.

German West Africa—Kamerun. *Deutsch. Kolonialblatt* 11 (1900): 870-874. **_____**

Bericht über die Thätigkeit der Strafexpedition nach den Cross-Schnellen. *With Plans.*

Account of the expedition for the punishment of the murderers of Lieut. von Queis and Herr Conrau, which traversed the country adjoining the Anglo-German boundary south of the Cross river. The plans show the military post founded at Nsakpe, near the "Ethiope" rapids.

Gold Coast. *Imp. and Asiatic Quarterly Rev.* 10 (1900): 300-309. **Bindloss.**

A Glimpse at the Gold Coast. By Harold Bindloss.

Ivory Coast.**Mille.**

Exposition Universelle de 1900. La Côte d'Ivoire. Notice par Pierre Mille. Ministère des Colonies, 1900. Size $9 \times 6\frac{1}{2}$, pp. 32. *Map. Presented by M. Charles Roux.*

Madagascar.

Madagascar. (Exposition Universelle, 1900.) Size 9×6 , pp. 206. *Illustrations. Presented by M. Charles Roux.*

Madagascar.

Scottish G. Mag. 16 (1900): 583-596.

Oliver.

The Land of Parrots. By Captain Pasfield Oliver.

This, the concluding part of Captain Oliver's description of the early history of voyages to Madagascar, brings forward the suggestion that the famous voyage of De Gonville in 1503-4 was to Madagascar, and not South America, as generally supposed.

Madagascar.**Porter.**

Trade of Madagascar for the year 1899. Foreign Office, Annual No. 2513, 1900. Size $10 \times 6\frac{1}{2}$, pp. 16. *Price 1d.*

Morocco.

Quarterly Rev. 192 (1900): 336-358.

Morocco, Past and Present.

A review of Mr. Budgett Meakin's 'Moorish Empire.'

Portuguese East Africa.**Cooper.**

Contemporary Rev. 78 (1900): 509-517.

Pioneering on the Beira Railway. By L. Orman Cooper.

Portuguese East Africa—Inhambane.**Parminter.**

Trade of the District of Inhambane for the year 1899. Foreign Office, Annual No. 2508, 1900. Size $10 \times 6\frac{1}{2}$, pp. 18. *Chart. Price 4½d.*

The report contains a new chart of the bar and harbour of Inhambane.

NORTH AMERICA.**America.**

Deutsche Rundschau G. 22 (1900): 492-508.

Jüttner.

Fortschritte der geographischen Forschungen und Reisen im Jahre 1899. 3.

Amerika. Von Dr. J. M. Jüttner.

On geographical researches and travels in America during 1899.

America—Hurricane.**Garriott.**

The West Indian Hurricane of September 1-12, 1900. By E. B. Garriott. *With Charts.*

On the origin and movement of the cyclone which destroyed Galveston.

Bermuda.**Alison.**

Bermuda. Report for 1899. Colonial Reports, Annual No. 293, 1900. Size $10 \times 6\frac{1}{2}$, pp. 12. *Price 1d.*

Canada—Rocky Mountains.**Wilcox.**

The Rockies of Canada, a Revised and Enlarged Edition of 'Camping in the Canadian Rockies.' By W. D. Wilcox. New York and London: G. P. Putnam's Sons, 1900. Size 10×7 , pp. x. and 310. *Maps and Illustrations. Presented by the Author.*

The illustrations in this work are of quite exceptional excellence, and vividly portray the characteristic features of the Rocky mountains.

United States—Arizona.**Murphy.**

Report of the Governor of Arizona.—Annual Reports of the Department of the Interior, 1898. Miscellaneous Reports. Pp. 229-405. Washington, 1898.

United States—California.**Moore.**

Trade of San Francisco and District for the year 1899. Foreign Office, Annual No. 2506, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 46. *Price 2½d.*

United States—Coast and Geodetic Survey.

Report of the Superintendent of the U.S. Coast and Geodetic Survey, showing the progress of the work from July 1, 1897, to June 30, 1898. Washington, 1899. Size $11\frac{1}{2} \times 9\frac{1}{2}$, pp. 490. *Maps and Plates. Presented by the Survey.*

United States—Colorado.**Lee.**

The origin of the debris-covered Mesas of Boulder, Colorado. By Willis T. Lee. *With Illustrations.*

United States—Colorado Canyon District.**Davis.***American J. Sci.* 10 (1900): 251-259.

Notes on the Colorado Canyon District. By W. M. Davis.

These notes, on a visit paid in June, 1900, are mainly geological.

United States—Exports.

No. 4. Exports of Domestic Merchandise from the United States, by Articles, Customs, Districts, and Countries, during the year ended June 30, 1899. Size $11\frac{1}{2} \times 9\frac{1}{2}$, pp. 431-670. *Presented by the Philadelphia Commercial Museums.*

United States—Indian Territory.**Bryan.**

Annual Report of the Mine Inspector for the Indian Territory.—Annual Reports of the Department of the Interior, 1898. Miscellaneous Reports. Pp. 731-776. *Illustrations.* Washington, 1898.

United States—Indians.

Annual Reports of the Department of the Interior for the fiscal year ended June 30, 1898. Report of the Secretary of the Interior. Report of the Commissioner of the General Land Office. Pp. cclvi. and 508.—Ditto. Indian Affairs. Pp. x. and 1134. *Map.* Washington, 1898. Size $9\frac{1}{2} \times 6$. *Presented by the U.S. Department of the Interior.*

This report contains a map showing the Indian Reserves in all parts of the United States.

United States—Kansas.**Udden.**

An Old Indian Village. By J. A. Udden. (Augustana Library Publications. No. 2.) Rock Island, Ill., 1900. Size 11×8 , pp. 80. *Illustrations.* *Presented by the Augustana College, Rock Island, Ill., U.S.A.*

On relics obtained from some ancient mounds in the Paint Creek valley, a tributary of the Smoky Hill river in MacPherson country, Kansas.

United States—Kansas.**Young.**

Cattle Trade in Kansas. Foreign Office, Miscellaneous. No. 537, 1900. Size $10 \times 6\frac{1}{2}$, pp. 8. *Price* $\frac{1}{4}$ d.

United States—Michigan. *J. Geology* 8 (1900): 498-503.**Davis.**

A remarkable Marl Lake. By Charles A. Davis.

This lake is remarkable on account of the great depth of marl in its bed and in the surrounding district, a fact which the author traces to the immense abundance of the plant *Chara* in its water.

United States—New Mexico.**Otero.**

Report of the Governor of New Mexico for the year ending June 30, 1898.—Annual Reports of the Department of the Interior, 1898. Miscellaneous Reports. Pp. 407-656. *Map and Illustrations.* Washington, 1898.

United States—Oklahoma.**Barnes.**

Report of the Governor of Oklahoma.—Annual Reports of the Department of the Interior, 1898. Miscellaneous Reports. Pp. 657-730. *Map and Illustrations.* Washington, 1898.

The report of the governor of the most recent territory of the United States "tells a story of progress, prosperity, and development never before equalled in the history of the States and Territories of the United States."

United States—Oregon.**Laidlaw.**

Trade and Agriculture of the State of Oregon, etc., for the year 1899. Foreign Office, Annual No. 2510, 1900. Size $10 \times 6\frac{1}{2}$, pp. 56. *Price* 3d.

United States—Texas. *Monthly Weather Rev.* 28 (1900): 146-150.**Cline.**

Special Report on the Floods in the Colorado Valley, Texas, April 7 to 17, 1900, and other Floods during the same period. By J. M. Cline. *With Maps.*

United States—Texas. *National G. Mag.* 11 (1900): 377-383.**McGee.**

The Lessons of Galveston. By W J McGee.

An eloquent description of the destruction of Galveston, of the causes which led to it, and of the precautions which the catastrophe suggests.

CENTRAL AND SOUTH AMERICA.

- Antigua.** *West Indian B.* 1 (1900): 402-414. **Watts.**
 Tree Planting in Antigua. By the Hon. Francis Watts.
 Care of Pastures in Antigua. By the same.
 The first paper recommends the re-forestation of parts of Antigua.
- Brazil—Madeira River.** *Deutsche Rundschau G.* 23 (1900): 20-27, 68-82. **Lamberg.**
 Der Madeirastrom. Von Moriz Lamberg. *With Illustrations.*
 A description of the Madeira and the dwellers on its banks, from personal observation.
- Brazil—Rio Tapajós.** *Globus* 78 (1900): 281-284. **Katzer.**
 Zur Geographie des Rio Tapajós. Von Dr. Friedrich Katzer. *With Map.*
 Notes collected during journeys in 1896 and 1897.
- Central America.** *B.S.R.G. d'Anvers* 24 (1900): 302-328. **Duckerts.**
 L'Amérique Centrale. Par M. J. Duckerts.
- Chile—Patagonia.** **Steffen.**
 The Patagonian Cordillera and its Main Rivers, between 41° and 48° South Latitude. By Dr. Hans Steffen. (From the *Geographical Journal* for July and August, 1900.) Size 10 × 6½, pp. 52. *Map and Illustrations.*
- Costa Rica and Colombia.** **Peralta.**
 Juridiction territoriale de la République de Costa-Rica. Réplique à l'exposé de la République de Colombia soumis à S. E. M. le Président de la République Française arbitre de la question de limites entre Costa-Rica et Colombia. Par Manuel M. de Peralta. Paris, 1899. Size 9½ × 6½, pp. 58 and 516. *Price 18s. 9d.*
 A collection of documents, beginning with the letter of Columbus dated July 7, 1503, in support of the contention of Costa Rica in the recent boundary question between that country and Columbia, with explanatory notes. The work includes material of considerable interest in connection with the early Colonial history of Central America.
- Cuba.** *B.S. d'Etudes Colon.* 7 (1900): 779-792.

- Cuba, son avenir.
 Based upon recent publications on the economic conditions of Cuba.
- Falkland Islands.** **Hill**
 Falkland Islands. Report for 1899. Colonial Reports, Annual No. 291, 1900. Size 10 × 6, pp. 22. *Price 1½d.*
- French Guiana.** **Bassières.**
 Notice sur la Guyane. Par E. Bassières. (Exposition Universelle, 1900.) Size 9½ × 6½, pp. iv. and 244. *Map and Illustrations. Presented by M. Charles Roux.*
- Guadeloupe.** **Guesde**
 Les colonies Françaises. La Guadeloupe et Dépendances. Par M. L. Guesde. Paris, 1900. Size 9 × 6½, pp. 36. *Map and Illustrations. Presented by M. Charles Roux.*
- Jamaica.**

- Further Correspondence relating to the Finances and Government of the Island of Jamaica. London: Eyre & Spottiswoode, 1900. Size 13 × 8½, pp. 50. *Price 5½d.*
- Martinique.** **Landes.**
 Notice sur la Martinique. Par Gaston Landes. Publiée à l'occasion de l'Exposition Universelle de 1900. Size 9½ × 6½, pp. 150. *Illustrations. Presented by M. Charles Roux.*
 A copious bibliography is an important feature of this monograph.
- Nicaragua.** *Globus* 78 (1900): 249-252, 271-276. **Sapper.**
 Reise auf dem Rio Coco (nördliches Nicaragua). Besuch der Sumos und Mosquitos. Von Karl Sapper. *With Illustrations.*
 The journey described was made early in 1900.
- Paraguay.** *Globus* 78 (1900): 217-220, 235-239. **Koch.**
 Die Lenguas-Indianer in Paraguay. Von Theodor Koch. *With Map and Illustrations.*

- Patagonia.** *B.I.G. Argentino* 20 (1899): 342-394. **Moreno.**
 Exploraciones en la Patagonia. Por F. P. Moreno. *With Illustrations.*
- Peru.** *B.S.R.G. d'Anvers* 24 (1900): 133-181. **Georlette.**
 Notice sur l'itinéraire du Voyage de Callao à Iquitos fait vers 1890-1892, par Monsieur Van Montenaeken. Par F. A. Georlette. *With Map and Illustrations.*
- Peru—Archæology.** **Polo.**
 La piedra de Chavin. Por Jose Toribio Polo. Lima, 1900. Size 10 × 7, pp. iv. and 66. *Illustrations.*
 On the carved stone, dating from the time of the Incas, discovered in 1840 among the ruins at Chavin, near the upper Marañon, with historical notes on the latter.
- Puerto Rico.** **Hitchcock.**
 Trade of Puerto Rico. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin No. 13.) Washington, 1898. Size 9½ × 6, pp. 84.
- Venezuela.** *Rev. Maritime* 146 (1900): 444-448. **Quiévreux.**
 La pêche des perles au Venezuela. Par H. Quiévreux.
 Traces the state of the pearl-fishery from the sixteenth century onwards.

AUSTRALASIA AND PACIFIC ISLANDS.

- Australasia.**
 Australasia. (The British Empire Series, vol. iv.) London: Paul & Co., 1900. Size 8½ × 6, pp. xx. and 364. *Maps. Price 6s. Presented by the Publishers.*
 Like the previous volumes of the series, this work is mainly composed of lectures delivered between 1895 and 1898 at the South Place Institute, Finsbury, since revised and brought up to date. Each of the several colonies is dealt with by a writer possessing, from his official position or otherwise, a special knowledge of the subject, and there are also chapters on Australian literature, Australian fisheries, the lost Tasmanian race, the Maoris, etc., besides one on Australia generally.
- British New Guinea.** **Haddon.**
 Studies in the Anthropogeography of British New Guinea. By Prof. Alfred C. Haddon, F.R.S. (From the *Geographical Journal* for September and October, 1900.) Size 10 × 6½, pp. [56]. *Maps and Illustrations.*
- Ethnology.** *Naturw. Wochenschrift* 15 (1900): 457-464, 472-475. **Frobenius.**
 Die oceanischen Bogen. Von L. Frobenius. *With Illustrations.*
 Treats of the distribution and various forms of the bow in Oceania.
- German New Guinea.** *Globus* 78 (1900): 201-203. **Thilenius.**
 Geologische Notizen aus dem Bismarck-Archipel. Von Dr. G. Thilenius.
- German New Guinea.** **Von Bennigsen.**
 Reisebericht des Gouverneurs v. Bennigsen.
 On a visit to the French islands and New Britain. See *Journal*, vol. xvi. p. 565.
- New Caledonia.** *Tour du Monde* 6 (1900): 493-504, 505-516. **Durand.**
 Chez les Ouébias, en Nouvelle-Calédonie. Par M. Jules Durand. *With Map and Illustrations.*
- New Caledonia.**
 Union Agricole Calédonienne. Notice sur la Nouvelle-Calédonie, ses richesses, son avenir. Rédigée pour l'Exposition universelle de 1900. Paris: Paul Ollendorff, 1900. Size 9½ × 6, pp. x. and 212. *Presented by M. Charles Roux.*
- New South Wales.** **Andrews.**
 Report on the Hillgrove Gold-Field. By E. C. Andrews, B.A. (New South Wales Geological Survey. Mineral Resources. No. 8.) Sydney, 1900. Size 9½ × 6½, pp. 44. *Map and Illustrations. Price 2s. Presented by the Geological Survey of New South Wales.*
- New South Wales.** **Coghlan.**
 The Wealth and Progress of New South Wales, 1898-99. By T. A. Coghlan. Sydney, 1900. Size 9 × 6, pp. xvi. and 1018. *Map. Presented by the Agent-General for New South Wales.*

New South Wales. *Records Geolog. Surv. New South Wales* 6 (1900): 153-357. **Dun.**
Contributions to a List of Papers and Reports dealing with the Economic Geology of New South Wales. By W. S. Dun.

New South Wales—Railway. *P.I. Civil Engineers* 142 (1900): 78-88. **Deane.**
Economical Railway Construction in New South Wales. By Henry Deane. *Plate.*

New Zealand. **Smith.**
Report of the Department of Lands and Survey, New Zealand, for the year 1899-1900. By S. P. Smith. Wellington, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. iv., xxii., and 288.
Maps and Illustrations. Presented by the Department of Lands and Survey.

New Zealand. **Lendenfeld.**
Neuseeland, von Prof. Dr. Robert von Lendenfeld. (Bibliothek der Länderkunde, herausgegeben von Prof. Dr. Alfred Kirchhoff und Dr. Rudolf Fitzner. Neunter Band.) Berlin: A. Schall [not dated; 1900]. Size 10×7 , pp. viii. and 186.
Illustrations. Price 6s. 9d.

Pacific Islands—Sailing Directions.

Pacific Islands. Vol. i. (Western Groups.) Sailing directions for the South-East, North-East, and North Coasts of New Guinea; also for the Louisiade and Solomon Islands, the Bismarck Archipelago, and the Caroline and Mariana Islands.—Vol. iii. (Eastern Groups.) Sailing directions for Tubuai, Cook, and Society Islands; Tuamotu or Low Archipelago; Marquesas; Line Islands or scattered islands near the Equator; Sandwich or Hawaiian Islands, etc. Third Edition, 1900. London: J. D. Potter, 1900. Size $9\frac{1}{2} \times 6$, pp. (vol. i.) xxvi. and 508; (vol. iii.) xxviii. and 270. *Index Charts. Price* (vol. i.) 5s.; (vol. iii.) 3s. *Presented by the Hydrographer, Admiralty.*

Pacific—Meteorology. *Quarterly J.R. Meteorolog. S.* 26 (1900): 235-241. **Hepworth.**
Remarks on the Weather Conditions of the Steamship Track between Fiji and Hawaii. By Captain M. W. Campbell Hepworth. *With Chart.*

South Australia. *Mem. R.S. South Australia* 1 (1900): i.-xv. **Stirling.**
The Physical Features of Lake Callabonna. By E. C. Stirling. *With Plate.*
This is specially noticed in the *Journal*.

Western Australia. **Maitland.**
The Mineral Wealth of Western Australia. By A. Gibb Maitland. (Western Australia, Geological Survey, Bulletin No. 4.) Perth, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 150.
Maps. Presented by the Government of Western Australia.

A treatise on the mineral deposits in Western Australia, with special reference to gold, and a series of geological and mineral maps.

POLAR REGIONS.

Antarctic. **Borchgrevink.**
The "Southern Cross" Expedition to the Antarctic, 1899-1900. By C. E. Borchgrevink. (From the *Geographical Journal* for October, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 34. *Map and Illustrations.*

Antarctic. *Petermanns M.* 46 (1900): 238-242. **Mewius and Supan.**
Borchgrevinks Südpolar-Expedition. Hauptsächlich nach Borchgrevinks Berichten in der norwegischen Zeitung "Aftenposten" von F. Mewius. Schlussbemerkungen von Prof. Dr. Supan. *With Map.*

The map shows the comparative position of the ice-barrier in 1842 and 1900.

Antarctic—Belgian Expedition. *B.S.R. Belge G.* 24 (1900): 417-531. **Gerlache.**
Relation sommaire du Voyage de la *Belgica*, 1897-1899. Par A. de Gerlache.

Antarctic Discovery. *B.S.R. Belge G.* 24 (1900): 365-415. **Gerlache.**
Note sur les Expéditions qui ont précédé celle de la *Belgica* aux Régions Circumpolaires voisines du Méridien du Cap Horn. Par M. A. de Gerlache. *With Maps.*

Arctic—Bear Island. **Forsberg.**
Bihang K. Svensk. Vetensk.-A. Handlingar 25 (1900) (No. 6): pp. 22.
Meteorologische und Wasserstand-Beobachtungen auf der Bären-Insel, während der Schwedischen Expedition 1899. Von C. A. Forsberg. *With Chart.*

- Arctic—Greenland.** *G. Tidsskrift* 15 (1899-1900): 194-202. **Amdrup and Hartz.**
 Den østgrønlandske Expedition; Premierløjtnant G. Amdrup's og cand. mag.
 Hartz' foreløbige Rapporter. *With Map.*
 On the Danish expedition of 1900 to East Greenland.

MATHEMATICAL GEOGRAPHY.

- Balloon Surveys.** *Sitzb. A.W. München* (1900): 149-164. **Finsterwalder.**
 Ueber die Konstruktion von Höhenkarten aus Ballonaufnahmen. Von S. Finsterwalder. *With Plate.*
- Cartography—Railway net.** *G.Z.* 6 (1900): 635-639. **Böttcher.**
 Mass für die Dichte der Eisenbahn-Netze. Von Böttcher.
 The writer points out a defect in the method of determining the mesh of the railway net of a country, suggested by Dr. Henkel (see *Journal*, vol. xvi. p. 129), and puts forward a revised formula for its calculation.
- Geodetic Formula.** *C. Rd.* 131 (1900): 635-637. **Hatt.**
 Sur la convergence des méridiens. Note de M. Hatt.
 On a revised formula for the calculation of the convergence of meridians.
- Motion of the Pole.** **Weeder.**
K.A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 546-558.
 The 14-monthly period of the motion of the pole of the earth from determinations of the azimuth of the meridian marks of the Leiden observatory from 1882-1896. By J. Weeder.
- Pendulum Observations.** *C. Rd.* 131 (1900): 654-657, 742-745. **Collet.**
 Sur la correction topographique des observations pendulaires. Note de M. J. Collet.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Age of the Earth.** **Dubois.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 697-734.
 Over den ouderdom der aarde. Door Eug. Dubois.
 On the various methods of estimating the age of the Earth, especially by the calculation of the time necessary for the formation of the carbonate of lime now existing on the globe.
- Bio-geography.** *Z. Ges. Erdk. Berlin* 35 (1900): 147-238. **Jacobi.**
 Lage und Form biogeographischer Gebiete. Von Dr. Arnold Jacobi. *With Maps.*
 The object of this study is to trace the manner in which movements of living organisms over the Earth's surface are the outcome of the dependence of such organisms on the soil on which they dwell.
- Meteorology—Clouds.** **Föyn.**
 Wolken-Beobachtungen in Norwegen, 1896-1897. Herausgegeben von dem Norwegischen Meteorologischen Institut. Bearbeitet von N. J. Föyn. Christiania, 1900. Size 13 x 10, pp. xiv. and 114.
 This volume contains the record of observations made at Bossekop on the nature and the height of the upper clouds for four months in 1896, in connection with the international cloud observations. Data of the nature and movement of the upper clouds at other Norwegian stations are added.
- Meteorology—Pressure.** *Meteorolog. Z.* 17 (1900): 420-424. **Börnstein.**
 Gibt es eine Beziehung zwischen Luftdruckvertheilung und Monddeklinaton?
 Von R. Börnstein.
 Particulars of the discussions of barometer-readings in relation to the position of the moon.
- Ocean Depths.**
 List of Oceanic Depths and Serial Temperature Observations received at the Admiralty during the year 1899, from H.M. Surveying Ships, Indian Marine Survey, and British Submarine Telegraph Companies. London: J. D. Potter, 1900. Size 13½ x 8½, pp. 20. Price 2s. 6d.
- Oceanography.** **Schokalsky.**
 Notice historique sur le développement de la science océanographique. Par J. de Schokalsky. [In Russian.] Moscow, 1900. Size 10½ x 7, pp. 50. *Charts.*
Presented by the Author.

Physical Geography.**Penck.**

Die Erdoberfläche. Bearbeitet von Universitäts—Prof. Dr. Albr. Penck. Sonderabdruck aus Scobel, Geographisches Handbuch zu Andreess Handatlas, 3. Auflage, Bielefeld and Leipzig, 1899. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 53-102. Presented by the Author.

Seismology.**Woerle.**

Der Erschütterungsbezirk des grossen Edbebens zu Lissabon. Von Dr. Hans Woerle. (Münchener geographische Studien, herausgegeben von Siegmund Günther. Achtes Stück.) München: T. Ackermann, 1900. Size $9\frac{1}{2} \times 6$, pp. 148. Maps. Price 25s.

On the region over which the great Lisbon earthquake was felt.

Underground Water. *J. Franklin I.* 150 (1900): 285-299.

Lyman.

Movements of Ground Water. By B. S. Lyman.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Historical—Cabot.****Winship.**

Cabot Bibliography, with an Introductory Essay on the Careers of the Cabots, based upon an independent examination of the sources of information. By George Parker Winship. London: H. Stevens & Co., 1900. Size $9\frac{1}{2} \times 6$, pp. lii. and 180. Presented by Sir Clements Markham.

A useful guide to the voluminous Cabot literature, both of former and recent years. The bibliography is arranged in two parts, the first including original sources of information, the second writings of commentators; the scope and substance of the works being described in explanatory notes. The author endeavours, in the introductory essay, to piece together an accurate account of what was actually done by the Cabots between 1460 and 1560, as to which such varying views have been held. His conclusions are generally cautious and reasonable.

BIOGRAPHY.**Dominik.**

Deutsche Rundschau G. 23 (1900): 37-38.

Oberlieutenant Hans Dominik. With Portrait.

Lieut. Dominik returned in 1893 from six years' pioneer work in the Cameroons.

Hagen.

Deutsche Rundschau G. 23 (1900): 87-90.

Dr. B. Hagen. With Portrait.

Dr. Hagen, a graduate of Munich University, went out to Sumatra in 1879, as doctor on a tobacco estate, and has since become known for his researches on the zoology and anthropology of Sumatra and New Guinea.

Ludwig Salvator.

Rev. G. 47 (1900): 161-172.

Harrasowsky.

L'archiduc Louis Salvator. Par M^{me} de Harrasowsky.

A résumé of the archduke's travels and literary labours.

Vassilieff.

Deutsche Rundschau G. 23 (1900): 38-40.

Stenin.

Prof. W. P. Wassiljeff. Von P. v. Stenin. With Portrait.

Prof. Vassilieff, a well-known authority on Oriental languages, died at St. Petersburg in May, 1900, at the age of 82 years.

GENERAL.**Almanac****Olsen.**

The Fisherman's Nautical Almanac and Tide Tables. A Directory of British and Foreign Fishing Vessels, Steamers, etc., 1901. By O. T. Olsen. London: J. D. Potter. Size $7\frac{1}{2} \times 5$, pp. 479. Plan. Price 1s. Presented by the Compiler.

Asia and Mauritius.**Verschuur.**

G. Verschuur. Aux Colonies d'Asie et dans l'Océan Indien. Paris: Hachette & Cie, 1900. Size $7\frac{1}{2} \times 4\frac{1}{2}$, pp. 410. Illustrations.

A popularly written account of visits to French Indo-China, China, Japan, Java, Mauritius, etc., with notes on some of the questions now attracting attention.

Educational—Maps.

G.Z. 6 (1900): 393-395.

Bräss.

Ein neues Verfahren, um Landkarten jeder Art zum Einzeichnen von geographischen und geschichtlichen Daten zu präparieren. Von Dr. M. Bräss.

Describes a new method of preparing wall-maps for class demonstrations by representing distributions, boundaries, etc., with coloured chalk, which can be washed out

afterwards. This is done by preparing a transparent cover which can be marked by chalk, and may be placed over any existing map, the lines of which can easily be read through the cover.

Geographical Terms. *Globus* 77 (1900): 371-374, 386-389. **Nörrenberg.**

Was bedeutet *Nord*? Von Dr. C. Nörrenberg.

On the origin of the word for "north," a purely philological study.

Geographical Year-Book. **Wagner.**

Geographisches Jahrbuch. XXIII. Band, 1900. Herausgegeben von Hermann Wagner. Erste Hälfte. Gotha: Justus Perthes, 1900. Size $8\frac{1}{2} \times 6$, pp. 172. Price 7 m. 50 p.

Reports on the progress of Terrestrial Magnetism by Prof. Karl Schering, the Physics of the Earth's crust by Prof. E. Rudolph, and the Physics of the Solid Earth by Prof. H. Hergesell, make up this section of the *Jahrbuch*.

NEW MAPS.

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EUROPE.

Balkan Peninsula. **Service Géographique de l'Armée, Paris.**

Balkans. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Service Géographique de l'Armée, Paris, 1900. 6 sheets. Price 7·50 fr.

This map of the Balkan Peninsula, which is printed in colours, is a continuation of the series of maps of different parts of the world, on the scale of 1 : 1,000,000, now being published by the French War Department. It embraces the whole of the Balkan Peninsula, and includes Greece and the neighbouring islands, together with the coast of Asia Minor.

Central Europe. **Erckert.**

Wanderungen und Siedelungen der germanischen Stämme in Mittel Europa, von der ältesten Zeit bis auf Karl den Grossen. Auf zwölf Kartenblättern, dargestellt von Roderick von Erckert, Kaiserlich Russischem Generalleutnant A.D. Berlin: Ernst Siegfried Mittler und Sohn, 1901. Price 12 marks.

To all interested in historical geography and ethnography this atlas should prove very useful and instructive. It shows, by a series of well-arranged and carefully coloured maps, the gradual migrations and advance of the German peoples, and their settlement in Central Europe from the earliest date to the time of Charlemagne. There is also a preface by Prof. J. Ranke, and a map of Central Europe at the second and third ice ages. The atlas contains altogether twelve maps.

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England and Wales.**Bartholomew.**

Reduced Ordnance Survey of England and Wales. Scale 1 : 126,720 or 2 stat. miles to an inch. Sheet 13, Derby and Notts. J. Bartholomew & Co., Edinburgh, 1900. *Price 2s. mounted on cloth. Presented by the Publishers.*

France.**Service Géographique de l'Armée, Paris.**

Carte des Chemins de fer Français. Scale 1 : 800,000 or 12·6 stat. miles to an inch. Service Géographique de l'Armée, Paris, 1900. 4 sheets. *Price 6 fr.*

ASIA.**India.****Ravenstein.**

Map of the Indian Empire, including Ceylon and the Straits Settlements. By E. G. Ravenstein, F.R.G.S. Scale 1 : 5,000,000 or 79 stat. miles to an inch. London : George Philip & Son, 1900. With an index and gazetteer. *Presented by the Publishers. Price 12s. 6d.*

This is a very useful general map of India and the surrounding countries, including portions of Tibet, Turkestan, Afghanistan, Baluchistan, Western China, the whole of Burma, Siam, the Malay Peninsula, and the western part of Sumatra. It also contains inset maps showing the military stations, railways, religions and languages of India, overland routes to India, Suez Canal, Somaliland and Aden, as well as plans of Bombay, Calcutta, Madras, Rangoon, and Singapore. That the map has been prepared by Mr. E. G. Ravenstein is in itself sufficient guarantee for general painstaking care. It is accompanied by an excellent gazetteer of India, preceded by several pages of descriptive and statistical letterpress, in which the system of spelling adopted is, as a rule, that of Hunter's 'Imperial Gazetteer.' Boundaries are clearly laid down upon the map, but on the north-west frontier they differ in some respects from those shown on other maps of the regions, and Hunza, Chitral, and Kuram are shown as British instead of semi-independent.

AFRICA.**Eritrea.****Istituto Geografico Militare, Firenze.**

Carta della Colonia Eritrea. Scale 1 : 100,000 or 4 stat. miles to an inch. Sheets : 3, Cheren; 4, Gheleb; 5, Pozzi di Kanfer; 6, Emberemi; 11, Asmara; 12, Ghinda; 13, Massaua; 18, Debaroà; 19, Saganeiti; 20, Afta; 23, Tucul; 24, Arrasa; 25, Godofelassi; 26, Digsa; 27, Adl Caièh; 30, Cohain; 31, Adi Quala; 32, Loggo Sarda; 33, Barachit. Istituto Geografico Militare, Firenze. *Price of each sheet, lire 1·5.*

When complete, this map of the Italian possessions in Abyssinia, or Eritrea, will



consist of thirty-four sheets, which are full of detailed information, and printed in colours. It is the result of survey work of Italian officers during the past ten or eleven years.

Tunis.

Service Géographique de l'Armée, Paris.

Tunisie. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheet lix., Iles Kerkennah. Service Géographique de l'Armée, Paris. *Price 1.20 fr.*

GENERAL.**World.**

Arnold-Forster.

The London School Atlas. Edited by H. O. Arnold-Forster, M.A. Published by the London School Atlas Co., Ltd., London, 1900. *Prices from 2s. to 3s. 6d., according to style of binding. Presented by the London School Atlas Co., Ltd.*

Mr. H. O. Arnold-Forster, whose geographical educational works are well known, has now succeeded in bringing out a school atlas which, owing to its general arrangement, style of production, and comparatively small cost, ought to secure a ready welcome from teachers and scholars. It consists altogether of forty-eight sheets of maps, plans, and diagrams, preceded by introductory "Notes on the Construction and Reading of Maps," by Dr. A. J. Herbertson, assistant to the Reader in geography in Oxford University, which, though somewhat brief, contains a good deal of useful general information. The maps are both political and physical, the latter showing elevations of land by a series of coloured contours and hachures. The depths of water, less and greater than 100 fathoms, are indicated on the physical maps by two different tints of blue, arranged, however, so that the darker tint indicates shallower water and the lighter the deeper, which is contrary to the usual custom, and somewhat misleading and unnatural. There is a sheet containing four little maps of the neighbourhood of Keswick on the same scale, showing different methods of indicating relief and topographical features, as now employed in the Ordnance Survey, by hachures and contours in black, hachures and contours in brown, and water blue, and contours combined with tints of colour. The next sheet is a reproduction of an Admiralty chart of the neighbourhood of the Needles, showing soundings and sandbanks. Both of these sheets will serve to enlighten the scholar on the various styles of cartography employed for special purposes.

World.

Freytag and Berndt.

Welt-Atlas. 54 Haupt- und 23 Nebenkarten nebst einem alphabetischen Verzeichnis von 15,000 geographischen Namen und statistischen Notizen über alle Staaten der Erde. Wien und Leipzig: Druck und Verlag der Kartogr. Anstalt G. Freytag and Berndt. *Presented by the Publishers.*

There are altogether in this little pocket atlas fifty-four principal maps and twenty-three insets, as well as a useful index to fifteen thousand places shown on the maps. Although all parts of the world are more or less represented, twenty-eight of the maps are devoted to European countries. As might be expected, Austria-Hungary and Germany figure most prominently; but England is hardly allowed the usual limited proportion of space allotted to it in continental atlases, and is only shown on one small general map containing the whole of the British Isles. The maps are well executed, and special attention seems to have been paid to means of communication, including steamer routes, upon which the number of hours occupied in passing from one port to another is stated.

World.

Johnston.

The World Wide Atlas of Modern Geography, Political and Physical. Containing 128 plates and complete index. With an introduction by J. Scott Keltie, LL.D., etc. 5th edition. W. & A. K. Johnston, Edinburgh and London, 1900. *Price 7s. 6d. Presented by the Publishers.*

No additional maps have been given in this new edition of the "World Wide Atlas," but attempts have been made to bring those that have already appeared up to date. The style of production is not altogether satisfactory, and many of the maps are far from clear. The introductory notes by Dr. J. S. Keltie give a brief summary of exploration in different parts of the World and the political changes that have taken place during the nineteenth century. Dr. Keltie is responsible for these, but not for the maps.

World.

Ravenstein.

Philip's Handy-Volume Atlas of the World. An entirely new and enlarged edition, containing 72 new and specially engraved plates, with statistical notes and

complete index, by E. G. Ravenstein, F.R.G.S. London: George Philip & Son, 1900. *Price 3s. 6d. Presented by the Publishers.*

Although this little atlas may, to some extent, be considered a new edition of one of the same title published a few years ago, it is, in fact, more than this, as the whole of the maps have been re-drawn, and the letterpress accompanying them re-written. It measures about $6\frac{1}{4}$ by $4\frac{1}{4}$ inches, and is only 1 inch in thickness, but within this small compass a vast amount of geographical information is contained, and the atlas will doubtless be specially useful for ready reference on a small table, and to newspaper readers.

World.

The Sphere Atlas Co., Ltd.

The Sphere Atlas (Elementary), Political, Physical, and Commercial. London: The Sphere Atlas Co., Ltd., 1900. *Price 1s. 6d. Presented by The Sphere Atlas Co., Ltd.*

This is another attempt to produce a cheap school atlas on approved educational lines. It possesses several novel features, and in its preparation Mr. Reginald Gill, the editor, has evidently kept in mind some of the leading faults of the usual style of school atlases published in this country, and has endeavoured to avoid them, although the innovations he introduces may not all be considered improvements. The sheet showing various countries of the world on the same scale, with the British isles in the centre, ought certainly to prove instructive, and give the scholar a good idea of the relative sizes, but it is surprising that America has been entirely left out. The most striking feature of this atlas is that the maps, instead of being surrounded by a black-lined border, as is usually the case, are carried to the extreme edge of the page in order to show portions of the regions surrounding the countries which the maps are specially intended to represent, and which are included within a white band. Whatever may be said in favour of carrying the maps to the edge of the paper, it is certain that this gives them a very unfinished appearance, and since the white bands often include areas far outside the country or region mentioned in the title, and make an awkward and puzzling break in the map, it would have been better to have left them out altogether.

The principal maps show the elevations of the land by a system of coloured contours and hachures, but, though a decided improvement on the ordinary cheap school atlas, it is, generally speaking, not so well finished as it might have been.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, September and October, 1900. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.		
3140 m	= 11·7	Guernsey :—St. Peter port.	1s. 6d.
3142 m	= 7·5	Netherlands :—Hook of Holland.	1s. 6d.
2113 m	= 8·8	Plans of anchorages on the west coast of Sicily :—Favignana, Marsala.	1s. 6d.
3125 m	= 5·9	Newfoundland, east coast :—Southern arm and Seal cove.	1s. 6d.
1330 m	= 1·2	Venezuela :—San Juan river.	2s. 6d.
1139 m	= 0·5	Mosquito coast :—San Juan del Norte to Blewfield bluff.	2s. 6d.
2425 m	= 0·5	Mosquito coast :—River Hueson to False cape.	2s. 6d.
1558 m	= 2·5	Korea :—Shoan harbour.	1s. 6d.
2400		China, east coast, River Min :—Plan added, Kinpai pass.	
993		Anchorages in Yezo island :—New plan, Suttsu bay.	
2973		Australia, south coast :—Plan added, Mary Ann haven.	

(J. D. Potter, Agent.)

Charts Cancelled.

No.	Cancelled by	No.
1558 Crichton harbour.	{ New plan. Shoan harbour	1558

Charts that have received Important Corrections.

No. 1951, England, west coast :—Liverpool bay. 109, England, east coast :—Entrance to the river Humber. 1872, North sea :—Calais to the river Schelde. 1518, Greece, east coast :—Gulf of Nauplia. 1520, Greece, east coast :—The Peiræus and Phalerum bay. 1715, Gulf of St. Lawrence :—Chaleur bay. 678, Lakes Erie and Huron. 519, Lake Huron. 2456, United States, east coast :—

Nantucket, sound and western approaches. 1290, Patagonia:—Nuevo gulf. 1313, Chile:—Channels between port de Aucud and port Montt. 1361, Africa, west coast:—Fernando Po to Cape Lopez. 643, Africa, south coast:—Port Natal. 2908, Africa, south coast:—Port Natal entrance. 650, Africa, east coast:—In-nambán river; Kilmán river. 14, Harbours and anchorages in the Red sea. 942A, Eastern archipelago, eastern portion. 2195, Anchorages in the eastern part of Celébes. 2662, Ports in Makassar strait. 2636, Strait of Makassar, north part. 1034, Australia, south coast:—Cape Naturaliste to King George sound. 2922, Australia, east coast:—Turtle group to Claremont point. 2921, Australia, east coast:—Claremont point to Cape Direction. 1101, Pacific ocean:—Mariana or Ladrone islands. 3097, South Pacific ocean:—Anchorage in the Friendly islands. (*J. D. Potter, Agent.*)

United States Charts. **U.S. Hydrographic Office.**
Pilot Charts of the North Atlantic Ocean for November, and of the North Pacific Ocean for December, 1900. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

Map Slides. **Dickinson and Andrews.**
The "Diagram" Series of Geographical Lantern Slides of Maps. By B. B. Dickinson, M.A., and A. W. Andrews, M.A.

With reference to these diagram map lantern slides, which were noticed in the last number of the *Journal*, it should be mentioned that they can be obtained from the Diagram Co., 27, Victoria Road, Clapham Common, S.W., and Messrs. G. Philip & Son, 32, Fleet Street, E.C., at 2s. each, with a reduction of 10 per cent. on a dozen or any quantity beyond this number. Special terms are granted to members of the Geographical Association.

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post office.

1-inch Scale.

	Price per sheet.
1. England and Wales, old series, in black, with outline and hill hachures. Size 36 × 24	2 6
Size 18 × 12	1 0
2. Ditto, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
3.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
4.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
5.*Ditto, hills hachured in brown, contours red, roads brown, water blue, magnetic variation shown, latitude and longitude not marked. Size	

* Publication in progress.

	Price per sheet.
18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1 0
Combined sheets	1 6
6. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1 9
7.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1 6
8. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
9. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
10.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted 9d. to	1 0
Folded in cover 1s. to	1 6
4 Miles to an Inch.	
11.*England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1 6
12.*County maps, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. Kent, size 22½ × 17 inches. Northumberland and Durham (combined), size 17½ × 23½ inches. In sheets, unmounted	0 6
Folded in covers	0 9
6-Inch Scale.	
13. Great Britain, water coloured blue or black lined, contours in black, latitude and longitude marked. Heliozincographed and photozincographed. Size 18 × 12 inches	1 0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6
$\frac{1}{3500}$ Scale.	
15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2s. 6d. to 23s., according to the amount of colouring. This form is gradually being superseded by 15.	
Town Scales.	
17. $\frac{1}{3500}$ scale, houses stippled. Size 38 × 25½	2 6
18. Ditto, houses ruled. Size 38 × 25½	2 6
19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2s. 6d. to 15s., according to the amount of colouring. Applies to unrevised only.	
20. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches	2 6
Index Maps.	
21. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0 2
22.*Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
23.*Index to the sheets of the 1 : 2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.	

* Publication in progress.

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The Geographical Journal.

No. 2.

FEBRUARY, 1901.

VOL. XVII.

The Death of the Queen.

It is only possible, at this time, to place on record the profound sorrow of the Council and Fellows of the Royal Geographical Society, at the loss which the Empire and the world have sustained in the death of Her Most Gracious Majesty Queen Victoria, Empress of India. The Queen did the Society the great honour of becoming its Patron when she ascended the throne, and of continuing the Royal Bounty of her predecessor, which enables the Society to award each year the two Royal Medals. Another opportunity will be taken of referring to the great qualities which will give Her late Majesty a supreme place in history, and to the almost unparalleled advances in Geographical Discovery and Geographical Science which have been made during her long reign. Here it must suffice for the Society to join in the universal expression of grief at the loss which the Empire has sustained; and to wish that Her Successor, King Edward VII., Emperor of India, may long be spared to us.

CLEMENTS R. MARKHAM,

President R.G.S.

EXPLORATIONS IN MAROTSELAND AND NEIGHBOURING REGIONS.*

By Major A. ST. HILL GIBBONS, 3rd East Yorkshire Regiment.

BEFORE proceeding to give a general account of the expedition I had the privilege of leading into Africa two and a half years ago, I wish to say a few words on the objects for which it was organized. Briefly, these objects were to complete the work I commenced in 1895, 1896, as described in the paper I read before this Society in January, 1897.

Lewanika, the paramount chief of many tribes residing in the upper Zambezi territories, rules over a vast country, with an area over twice the size of Great Britain, roughly extending, as I am now in a position to assert, from the Congo-Zambezi watershed in the north, to 18° S. lat. in the south, and from the Kwito in the west, to the Kafukwe in the east. Under the 1891 convention with Portugal the Anglo-Portuguese frontier is synonymous with Lewanika's western boundary. This was the arrangement by which Lewanika petitioned the Great White Queen to assume a protectorate over his dominions, and in accepting the responsibility Great Britain undertook to preserve the chief's territory intact. But so little was known either of the political or geographical conditions of this country, that the supposed frontier has been continually shifted during the past decade between the Zambezi and some 200 or 300 miles westwards. Livingstone, as you well know, travelled up the Zambezi as far as Nanakandundu, and thence westward to Loanda half a century ago. To his work little has been added beyond the result of Serpa Pinta's journey along the old slave route to Lialui—an east and west road to Benguella, and that of Capello and Ivens on the same route, and thence up the Kabompo. Missionaries and others have passed up and down the river since, but the great bulk of the country has remained a *terra incognita*.

The objects, then, of the expedition were—

(1) To determine the geographical limits and tribal distribution of Lewanika's empire, and thus I trust to so far substitute fact for conjecture as to place sufficient material at the disposal of H.M.'s Government, and that of His Majesty the King of Portugal, to simplify negotiations between our old friend and ally and ourselves, and thus facilitate an early and friendly settlement agreeable to both countries.

(2) To supply what may be called a skeleton map of Marotseland by travelling the country in all directions.

(3) To study its resources and commercial possibilities, and

* Read at the Royal Geographical Society, December 10, 1900. Sketch-map, p. 126. Map, p. 224.

(4) To ascertain how far the Zambezi and her affluents can be utilized as practical waterways.

I disclaim the Cape to Cairo globe-trotting objects attributed to us. They grew out of my statement that when our work was finished we would return by the east, the west, or the north, adopting the last route for choice as offering greater interest. I have always felt that long, straight routes through Africa ceased to be of anything more than very ordinary value when once the main features of the continent had been determined; and that to turn a somewhat hard and uncertain profession to its best account, the latter day explorer had best select a circumscribed district and work it thoroughly; 5000 miles within such an area is immeasurably more valuable than the most imposing line from coast to coast. If, therefore, the expedition deserves any credit for its work in Africa, we claim it not for the lines we have made from Capetown to Cairo and from Chinde to Benguella, but for the more serious

~~useful work we have accomplished in Marotseland~~

MAJOR GIBBONS' MAP.

The detailed map for Major Gibbons' paper will be published, it is hoped, with the March number of the "Journal;" in binding, it should be placed at the end of the present number.

—owing to the tsetse curse—he alone was available of the three for work in the objective country. To move so large an expedition in this way, with the extra goods required to pay and sustain them, would have necessitated at least 600 carriers, to say nothing of askaris to keep them together and prevent desertion, so I decided to depart from the usual lines and utilize the waterways which nature has placed at our disposal. Thus we landed at the Chinde estuary of the Zambezi on July 16, 1898, with two aluminium launches, 26 feet long with a 6 feet 6 inch beam, and a barge 22 feet 3½ inches long. These were built in interchangeable sections, so that the steamers could be lengthened, or damaged sections replaced, at the expense of the barge. Contrary to advice I adopted what is known as the Hodgett's principle of hull construction. With their three modified keels and catenarian curves, the launches shared all the advantages of light draught with the flat-bottomed boat,

and at the same time by reason of the firm grip they had on the water, seem to me to answer the helm even better, and sail closer to the wind, than the usual single keel boat. I have been witness to the unwieldiness of flat-bottomed steamers in eccentric currents on the Zambezi and the Nile, and I feel sure Government and trading companies will do well to take advantage of my experience in this matter.

On the 18th we left Chinde in the *Centipede*, chartered from Sharrer's Zambezi Traffic Company, to take us bag and baggage to the foot of the Kebrabasa Rapids. A land journey of 70 miles is necessary to clear this bar to navigation, and I was anxious to save time and the extra work of constructing and disjoining the flotilla for the passage of the lower river. With me were Captain Quicke, King's Dragoon Guards; Captain Stevenson-Hamilton, 6th Inniskilling Dragoons; Mr. L. C. Weller, of Trinity Hall, Cambridge, who had an engineering training, and, fortunately for the expedition, cut short his University career in order to be one of us; Captain Boyd Alexander, 7th Rifle Brigade, an energetic ornithologist, who was assisted by Mr. Ramm, a professional skinner; and Mr. Theo. Muller, an accomplished linguist of considerable experience with natives who travelled from Capetown *via* Mashonaland, to join the expedition at Tete.

The Lower Zambezi is too well known to call for more than a very few remarks from me. Save for the picturesque Lupata Gorge through which the Zambezi flows deep and swift, the lower river, at the time we passed up it, is merely a broad expanse of sand, three to five miles wide, with low, reed-fringed banks, and intersected by numerous shallow streams. So shallow are these streams, that the *Centipede*, with a draught of but 28 inches, took three weeks instead of six days to reach Tete. You can, therefore, easily calculate the number of hours we spent on sandbanks, and the amount of unnecessary towing and digging, for which a certain aluminium company was responsible, in trying to palm off an inferior article for the construction of the boats, and thus necessitating a six weeks' delay. I calculate that this wretched company cost us nearly three months' delay and a power of hard work in our passage to the Victoria falls, by compelling us to do the journey at the most difficult time of year.

On August 13 we reached the confluence of the Mesenangwe river, at the lower entrance of the rocky gorge through which the river surges in an unnavigable torrent, known as the Kebrabasa Rapids. I was astonished to find so little water in the river here. In 1895 I travelled the Upper Zambezi at the same time of year, and have no hesitation in saying that the Zambezi carries more water below its confluence with the Kwando or Linyante river during the last two or three months of the dry season, than it does here, nearly 1000 miles down stream. This is, no doubt, due to the fact that, with the exception of the Kafukwe, no affluent of the Middle river supplies more than

an inappreciable quantity of water in the dry season, while, on the other hand, the soakage and evaporation in thirsty Africa must be considerable.

Kebrabasa, "the place where service ceases," is the first bar to navigation from the sea. Livingstone reached there on November 9, 1858, in his steamer the *Ma-Robert*—the herald of steam power and navigation on the Lower Zambezi. The father of modern explorers made gallant attempts to pass this barrier, but nature won the day. I will not waste time by describing this rocky gorge. To do so would be merely to repeat Livingstone. I have passed over much of his work at one time and another, and have never discovered in his descriptions the



PURCHASING CORN, MIDDLE ZAMBEZI.

smallest tendency to over estimate or exaggerate. These rapids remain as a lasting monument to the moral strength of the man who attempted and repeated the attempt to force a passage through them.

It was not until September 21 that the whole expedition was encamped at Chikoa, after 5½ weeks of hard work in readjusting the loads and rushing about in various directions between Mesenangwe and Chikoa, to secure the 457 porters necessary to convey the steamers and loads over one of the most difficult countries I have passed through. The services of Mr. Muller were of special value to the expedition at this juncture, not only did his indomitable energy relieve me personally

of much hard work, but his knowledge of Portuguese neutralized the inherited inconvenience consequent on the indiscreet conduct of the gentlemen of Babel. The local magnate at Chikoa was a coloured Portuguese known as Senhor Ignatio de Jesus Xavier, an honorary lieutenant-colonel in the Portuguese army. This gentleman had a widespread reputation for placing difficulties in the way of English travellers, and of being especially grasping in his dealings. Contrary to expectation, I am glad to say we suffered in neither direction at his hands, and he responded promptly to every call made on him. I am afraid I must confess, from what I saw of two traders who tried to pass Chikoa but failed, that Englishmen sometimes create the difficulties from which they suffer. It transpired that our friend Senhor Jesus was with Livingstone in 1858, and he openly confessed that he was glad to be of service to the expedition which was to continue the work of his former master. Possibly a more curious coincidence connecting the *Ma-Robert* with our little steamer *Constance* is, that the former first reached her goal at the foot of the Kebrabasa on the very day that the more humble owner of the *Constance*—the pioneer steamer above these rapids—first saw the light of day.

The steamers, once together, were loaded up, and made a start up-stream. We worked hard for some days, but made little progress. It was evident that the boats were overloaded, in other words, that their practical and theoretical capacity were not synonymous. I soon decided on what, in my own mind, was the only wise course to adopt, but for obvious reasons kept my thoughts to myself, until one day my officers helped me out of the difficulty by making the suggestion I wished for. They had unanimously decided that I had best take Captains Quicke and Hamilton on in one steamer with Mr. Weller, and supplies for the three of us for six months, and get on to the work of the expedition in Marotseland as early as possible, while the others brought the main supplies forward as best they could, until Mr. Weller returned to help them with the empty steamer. I at once acquiesced, arranging that Mr. Muller, after a hurried visit to Tete, with Captain Alexander and Ramm, should take everything to Zumbo in two journeys, and thence to the Kafukwe confluence. Mr. Weller would then take command and steam up the Kafukwe, establishing a base camp as far up the river as possible, open communications with us in the west, and make a series of short expeditions alternately with Mr. Muller and Captain Alexander until our arrival, on the completion of the work for which we entered Africa. We would then carry to the Luapula and follow the lakes route. A trial showed that the steamer carried $4\frac{1}{2}$ tons admirably, so in two days we steamed up river under more favourable circumstances.

Between Chikoa and Zumbo the Zambezi varies between a single deep stream and a shallow sandy bed, similar to but much narrower

than what I have already described as existing in the lower river, the latter feature predominating. There are but two rapids in this stretch—the Chansenga and the Kakolore. Zumbo was reached on October 21, and the next day we steamed into British territory. I take this opportunity of publicly expressing my deep sense of gratitude to the Portuguese for their unvarying courtesy and kindness during our passage through their territory. Officers and civilians, from the Governor-General downwards, did everything in their power to further our interests and facilitate our undertaking. From Zumbo the scenery becomes very fine for some 35 miles. The river flows in a deep clear



BATONGA WATCHING THE PROGRESS OF THE *CONSTANCE*.

stream through a well-wooded, mountainous district, while a fringe of dark heavily-leaved trees, beyond the light-coloured sand lining the water's edge, imparts a pleasing variety to the picture. On the third day from Zumbo we entered the gorge shown as "Kariva" on the maps. This same gorge is known as Lupata, in the Zumbo district. Both are native words, signifying "gorge," in different dialects—Kariva being simply another pronunciation of Kariba, the name by which the third gorge—that above the Kafukwe confluence—is known. That two of these should be known by the same name is inconvenient, even though the "b" in the one case be exchanged for a "v" in the other. It seems to me that the undeniably sound rule of adopting native names is best partially departed from in this instance, so I have added the name "Livingstone" to "Kariva" on my map, and submit that

geographers would do well to adopt the suggestion, and thereby not only avoid inevitable confusion in the future, but serve the second purpose of associating the name of the great explorer with one of the grandest pieces of scenery on the most beautiful of the four great rivers of Africa—that river whose mysteries he did so much to unravel.

Near the eastern entrance of this gorge we faced the most difficult rapid as yet met with. With a fall of 3 feet in 30 the river rushes between rocky banks only 40 yards apart and then flows in a seething current for some 250 yards. With the help of a backwater we reached a small bay immediately below the rapids. In the first attempt—using of course the tow-rope—the bows of the boat got wedged between two hidden rocks. Lowering her down, the goods were off-loaded, and we tried again. This time the rope was forced from the boys' hands, and we were swished down stream for some 200 yards before we could get into quieter water. Next time the rope, refusing the strain, broke, and away we went once more. The fourth attempt proved successful after a long, hard pull. So great was the rush of water at the critical moment that, while the bows were all but submerged, the keel immediately beyond was almost laid bare. Four years earlier a Portuguese officer lost his life in these rapids. While being towed through, the rope broke, the boat capsized in the rushing water below, and he, with part of his crew, was drowned. Once in the gorge, we steamed through a deep slack stream confined within narrow limits by precipitous wooded mountains. As the river widened things changed for the worse. Three days of much tow-rope and little progress culminated in an accident, which promised at one time to be serious. Thrice the rope was forced out of the boys' hands in attempting to pass a rapid, and the last time became entangled in the screw. We had sprung a serious leak after a succession of violent bumps on the rocky bed, and with our screw helpless bade fair to go down in deep water. The rope was disentangled none too soon, and we made a stony island in a sinking condition. Much damage was done to provisions, and it took Mr. Weller three days of work from sunrise to sunset to repair damages.

As the Kafukwe is approached the river widens considerably, and is free from rocks. The banks of yellow clay, intermixed with gravel, are constantly being eaten into by the action of the water. As the land slips trees fall with it and are distributed about the river-bed in all directions. The Kafukwe enters the parent river in a quiet deep stream about 200 yards wide with well-wooded banks. It is navigable for some 20 miles, when there must be a rise of about 1000 feet in little over 15 miles. Captain Hamilton, on his return from the seat of war, will be able to tell us something of the lower reaches of this river, as he followed its course, so far as possible, on his return journey to the east coast.

To the Sanyate confluence in the Kariba Gorge the river is easy of navigation, but here the Nakabila Rapids offer many dangerous obstacles at this season. Pointed rocks rise above the water surface; and there is evidence of others only a few inches below. I decided to carry over land, as the rope was not long enough to tow with safety from the high walls of rock confining the river. The local natives undertook to convey the steamer and goods to a place 3 miles up stream, but finding the carriage of the boiler over the huge blocks of basalt no easy task, they struck and departed.

Our Portuguese friends had warned us time after time that the boys would certainly desert before they got beyond their ken. The usual scares had been disseminated among them—such as a small-pox epidemic in front, while they were credibly informed that the natives up the river put poison in the food they sold, and that the people further on were cannibals. Consequently I was more annoyed than surprised when one fine morning all but five were missing. Wearing my revolver for the first time since my first arrival in Africa, ten years ago, I hurried off in pursuit with Captain Quicke and Mr. Weller till we reached a native settlement 2 miles up stream. The first village knew nothing; the second had seen them pass. I soon arranged—for a blanket a piece—with two guides to follow up the runaways, and leaving my companions, set off at a double, with my Zulu servant carrying a Mauser. After 3 miles of this I met one boy, apparently returning. He fell on his knees, imploring me to spare his life. As I had no intention of taking it, I magnanimously granted his request on condition he led me to his fellows. A little further on I caught them in a hollow, and was in their midst before they suspected my approach. Throwing down their bundles they made off in all directions, but a threat to fire brought them to a standstill. In a short time they were making their return journey, the Zulu in front, myself behind. For the next three days they were never out of sight of a revolver night or day, and were treated with all the harshness their conduct merited, until the steamer was once more floating and loaded. Henceforward these boys behaved admirably, and several occasions later almost surprised me by their devotion. I am convinced that had they been merely lectured and told not to do it again, they would have repeated the attempt within a week.

The next 100 miles were pleasant travelling; banks were high and water deep. This stretch is much more thickly populated than any other part of the Middle river, though quite nine villages out of ten were on the north bank; probably the Matabile raids of the past had driven the people across the river for better protection. The interest these natives—the Batonga—took in the steamer was amusing; crowds, mainly composed of women heavily decked in beads, would run along the banks dancing and singing and chattering. It was comical to note

the effect of the whistle; every other sound ceased in an instant, and they went for all they were worth. And now came the last and hardest 25 miles of our river journey. It began with the Molele rapids, then the Sepanga, and after these several others—about twenty in number. On one occasion, when the steamer was held immediately aft the engines by a pointed rock, just as we were clearing the worst rapids we negotiated, and, in spite of the boys on the rope, was gradually being forced round broadside to the stream, we were for some minutes in a most awkward position. Never before or since in the whole course of my African experience have I felt the odds against me as I did on this occasion. I have no time to describe the incident, but by a supreme effort on the part of both white men and black, the boat, goods, and some of ourselves were saved from certain destruction.

Finally, after unceasing work, we found ourselves 2 miles beyond the Guay confluence. The last 8 miles were through a most dismal gorge. The river, swift and narrow, is broken every few hundred yards by rocky barriers. It would be hard to exaggerate the almost lifeless dreariness of this gorge, and as it has not been described before, I will endeavour to do so. The river reflects the grey-black colouring of perpendicular walls of basalt, standing only 60 to 100 feet apart. These in turn impart an inky hue to a water surface disturbed by conflicting currents and whirling eddies. Above these, huge flat-sided boulders are strewn about in confused disorder. In travelling over them, as one or the other of us had to do on several occasions, the maximum pace was one mile an hour. The rocks are surmounted by precipitous hills, 7 or 8 hundred feet high, covered with forest and tangled undergrowth. Nothing is to be heard above the dull continuous murmur of the water. I know no place in this world which so reminds me of what some of us are told to expect in the next, so named it the Devil's Gorge, since even those few natives we met with immediately beyond its precincts insisted that they only had names for some of the rapids, but none for the gorge itself.

A cursory examination of the river ahead convinced me that we had tested the navigability of the middle Zambezi to the full, and that a further advance by water could serve no useful purpose, for I knew that Wankie's—more properly called Zonki's—could not be more than a few miles in front, and that when once there we were within touch of Marotseland. To carry our goods, with the few boys at our disposal, in six or seven relays, until we could find the requisite number of porters, seemed to me preferable to a return to the nearest village, 35 miles down stream, without any certainty of inducing the natives to carry our loads. Therefore, Captain Hamilton and myself, with fourteen boys, left the *Constance* moored to a ledge of rock on the north bank the following afternoon. In two days we had travelled 7 miles, and were much relieved to see native cultivation on the opposite bank,

for the boys were foodless, and, but for a timely shot at a baboon, would have had nothing to eat since leaving the steamer.

We soon made friends with an old man who, with his wife and one son, proved to be the sole occupant of the village. He undertook to guide Captain Hamilton by an easier route south of the river. This necessitated the crossing of the steamer. The fact that she was carried over a mile down stream before she could make the opposite bank, about 100 feet away, gives an idea of the swiftness and treacherous character of the current in the Devil's Gorge.

On December 29 we bade farewell and God-speed to Mr. Weller and the little steamer which had been our home for so long. She had had



NATIVE-MADE HOUSE AT LIALUI FOR LEWANIKA'S SISTER.

a rough time of it, but, thanks to Mr. Weller's skill, was still seaworthy. She had been beached four times—three with holes in hull, and once with a bent shaft—in her passage up the river. However, I foresaw no difficulties in her return journey, for the water had already risen considerably, and every rapid had at least one deep stream through which she could pass without danger.

About 2 miles above our camp the river rushes over a rocky bank in a cataract, known by the local natives as Sichiwene. The water comes over in two broken falls within a few yards of one another, dropping about 12 feet in all.

By January 1, 1899, everything was ready for a further advance

Makwa Zonki's village on the river—his own town being on the Guay—was only a short day's march, so I started thither with Captain Quicke and six boys, hoping to procure porters. We were unsuccessful, so the next day I crossed the river with the intention of making forced marches to Sesheke, a short 200 miles west, arranging that Captains Quicke and Hamilton should remain with the goods till I could procure boys to bring everything forward. The path for the first two days was up a rough ascent of nearly 2000 feet. The invigorating and stimulating effect of such a change upon the traveller is most marked, and travel becomes a pleasure instead of a toil. Such a fact seems to me to demonstrate the important part the uplands of Africa are destined to play in the future development of the empire. When once on the plateau, my path took me over gentle sandy undulations, covered with open forest.

In twelve days I was at Sesheke, where I found my old friend Letia, Lewanika's son and heir, who at once arranged that 70 porters, under two chiefs, should proceed to Makwa without delay. In the mean time I made a hurried journey to Lialui by land, with a view to arranging matters with Lewanika. I was able by this journey to make additions to the map of this part of the country, which was published by the Society in 1897, as the result of my work during the two previous years. On reaching Lialui I had the disappointment of missing my friend, Major R. T. Coryndon, who, some months earlier, had been appointed first British agent of Marotseland. On hearing of my arrival, he very kindly made preliminary arrangements with Lewanika on my behalf, and hurried down to Sesheke to meet me. Thus the chief was prepared for my suggestions; his native mind had been allowed time to work; and he at once fell in with my plans. He agreed to supply three caravans. With one I proposed to travel along the western boundaries of his dominions, thence by the Congo-Zambezi watershed to the source of the latter river, and then trace its course back to Lialui. Captain Quicke would go west to the Kwando-Kubanguï confluence, follow the former to its source, and return to Lialui by the Lungwebungu and Zambezi; while Captain Hamilton, after following the Kwando to the Kubanguï, would make for Lialui by a route south of Captain Quicke's. While in Burotse it rained incessantly. During the first eleven days of my visit the rain-gauge registered 13 inches, or nearly half the annual rainfall of London. Lewanika lent me some of his own paddlers for my return journey to Sesheke. They were a splendid lot of fellows, and paddled their canoes at the rate of 70 miles a day. We travelled with the stream, of course, but half the distance would be good for most natives.

I was in Sesheke again on February 23. Two days later Major Coryndon arrived, and, nothing having been heard of Captains Quicke and Hamilton, we went together down stream to Kazungula. There

we found Captain Hamilton, who had tramped in the day before with one boy. He reported that their journey had proved a very rough experience. Heavy rains had fallen incessantly, and the rivers were consequently in flood. The porters, who had suffered much from hunger while passing through the unpopulated country during the first half of the march, had dispersed among the villages some three days' journey off, and had been away four days at the time he left. Both he and Captain Quicke, in spite of such adverse circumstances, had enjoyed excellent health. I immediately despatched Jack—an interpreter Lewanika had placed at my disposal—with a letter to Captain Quicke, asking him to come in to Kazungula, and not attempt the land journey to Sesheke, as all the rivers were in flood. However, he was already within a day of Sesheke when he received the letter, and on receipt of this news we followed him thither by canoe.

At Sesheke I received a letter which had found its way across country from the Kafukwe, in which Mr. Weller wrote that on his arrival there he found Captain Alexander. One passage caused us much grief. "Muller," it ran, "was taken ill with dysentery at Tete, but did his best to push on, and was last heard of in a dying condition at Kashombe." This was bad news indeed, though, while fearing the worst, we hoped for the best. The letter also stated that Captain Alexander had mentioned his intention of returning home, and that he himself was very ill, but would do everything in his power to bring further supplies forward.

Before proceeding to describe our travels in Marotseland, I wish to correct a statement I made in a paper I read before this Society four years ago. I stated then, as the result of information I had received, that Marotse, Borotse, and Barotse signify the people, the country, and the individual. The first is correct, so is the second, except that a short "u" is best substituted for the "o" in the prefix, but the last is quite wrong. During my last visit to the country, I spared no pains in determining the correct spelling of the tribal names of these people and their subject tribes, and have no hesitation in affirming the correctness of Marotse and Burotse as applying to people and country. Popular usage would seem to insist on the Anglicizing of the names of all native states in South Africa by adding "land" to the native name. Thus, in this case, Burotse falls into disuse and becomes Marotse-land.

The rains were practically over when, on March 22, I left Sesheke with Captain Hamilton for the west. We crossed the Zambezi and traversed the flat, almost waterless country lying between the Kwando or Linyante and the parent river, reaching Mamili, an important village situated near the former in $18^{\circ} 3' 30''$ S. Lat., four days later. In the chief Mamili I found a most intelligent and interesting old man, from whom I gleaned much information bearing on the people and their

history. It was he who carried Livingstone's message to Sebitwane, apprising the Makololo king of his approach, and asking leave to enter the country, and who returned with a message of welcome. In talking about Livingstone, the old man told me that Sekeletu—who succeeded his father Sebitwane—when the Doctor left the country after his second visit, lent him the services of a number of Matoka, Matotela, Masubia, and Marotse slaves under the Makololo chief, Sekwebu, but that they had never returned, and were all dead. He was very interested to hear that, so far from being dead, these slaves had settled in British Central Africa, had taken to themselves wives, and become quite a large tribe, but that Sekwebu, after going mad, jumped into the sea and was drowned. It may interest ethnologists to hear that there is not a drop of Makololo blood in the so-called Makololo of British Central Africa. Mamili said that he had witnessed Livingstone's departure, and insisted that Sekwebu was the only Makololo among them. He further confirmed a statement I made four years ago to the effect that the lower reaches of the Kwando have never been known by the natives as Chobe, but that the name of the old capital, Linyante, had been applied to the river since its foundation. He had lived on the river all his life—at least seventy years—and had been chief of the whole district for thirty-five years.

We left old Mamili, after having photographed him and his wives—he suffered from twenty-five—on March 24. We had experienced the greatest hospitality during our ten days' visit. A hut 30 feet long had been built and enclosed in a circular courtyard of 60 feet diameter. The grass and bush had been cleared for some distance round, and a wide road been cut to the village. On our arrival he presented an ox, meal, and vegetables, while twice daily fresh milk was brought for our consumption.

I had asked Lewanika to give me one chief or headman only, but he insisted on sending eight—five to travel with me, and three with Captain Hamilton. This, of course, was his way of paying a compliment, but in doing so he gave me a following of over a hundred, whereas I have always found that for comfort and pace twenty is a good maximum. The journey for the first few days was interesting only from a historical standpoint. I was shown the battle-field on which the conquering Makololo defeated Bololo, the Marotse general, eighty years ago, and thereby gained an ascendancy over the people of the country; also the tree under which Sebitwane died in Livingstone's presence thirty years later, and the confines of the old town of Linyante, which covered a considerable area in those days, but is now replaced by three small hamlets.

I crossed the Kwando in $18^{\circ} 7' 30''$ S. lat., on the same day bidding adieu to Captain Hamilton, who followed the course of the river northwards. We all three hoped to "rendezvous" at the Kubangui-Kwando confluence six weeks later.

Lewanika had told me of a stream, called Mag'wekwana—with a click after the "g"—which connects the Okavango with the Kwando after the rains. I travelled south till I struck this, and then followed its course westwards. For the first few days the bed was clearly out, and about 100 yards wide, but at that time perfectly dry. I wondered whether this was not the original bed of the Okavango, and whether that river had not at one time been part of the Zambezi system. On April 14, the bed having become much wider and less well-defined, we saw in front numerous water-fowl flitting about. My chiefs grunted their disapprobation on seeing this, informed me that the water was coming, and a short distance further we were ankle deep. The overflow from



GROUP OF MALUNDA NEAR ZAMBEZI SOURCE.

the Okavango had commenced, and since the definite bed of the river had now disappeared, the whole country to right and left was inundated. For three and a half days I had to wade knee-deep, camping wherever I could find a comparatively dry spot. I was just a week too late, but my guides assured me that another week would have meant water to the shoulder; in fact, in one or two places it was so already. The natives told me that the overflow continued for a couple of months, when the inundations gradually drained off into the Kwando, and the land became dry once more. The overflow occurs in about 19° S. lat., and here I found dry ground near a deserted village, called Bietcha, which had been the scene of a tragedy.

Five days earlier two natives came to my camp, and implored me to give my aid in restoring their wives and goats, which had been appropriated by others under the following circumstances. A fellow-villager, named Macumbe, had been away on a journey, leaving his wife behind him. On his return he found that Niru, of Sejala, an adjoining district, had exerted his charms, and taken her to wife. An argument followed, and the people of Bietcha decided, on the woman refusing to return to her lawful husband, that she need not do so, but that she must leave Niru also. They then went to Sejala to claim her, but Niru refused to give her up. A few nights later he collected a following from his own and two neighbouring districts, surprised Bietcha, broke Macumbe's arm, cut off both feet, and shot him. A brother running to the rescue, was stabbed in the back and killed. On this the men of Bietcha fled, and Niru and Co. appropriated the women and goats. I directed the two men to accompany my caravan, and promised to do what I could for them. In six days I had released the captive ladies, some thirty in all, and handed them over to their devoted husbands; nor was I the recipient of a single word of thanks from man or woman.

The next day I was skirting the inundated plain through which the Okavango flows. This is several miles wide, and is bounded by high, dark yellow sandy undulations, growing thorny acacias and entangled undergrowth. As there was no path through this, I found constant wading preferable to working a passage through the thorns.

Two distinct tribes occupy this district. Maiye, whose country extends southwards, and Mampukushu, who had left their own country, twelve days up stream, because their chief, Lebebe, insisted on selling their children to the Mambare slave dealers from the West Coast. The Maiye resemble the South African native in type, are a shade lighter in colour, and wear their hair short. Their half-ball-shaped huts are formed by tying mats over a wooden framework. The Mampukushu are quite black, and live in cone-shaped, grass-thatched huts. The men cut their front hair short, while the remainder is long, and falls back in ringlets. Their women allow their hair to grow long, and work in bark thread, which hangs down to below the back, giving it the appearance of being long and straight. At night this is coiled up on one side of the head, and acts as a pillow.

Leaving these people behind, I passed for some days through a district inhabited by bushmen only. They are light in colour, and bigger than their Kalahari fellows. In talking, they give the impression of being in the transition stage, between the click and throat method, of conversing. Imagine the hollow, indistinct utterances such as proceed from a roofless mouth, relieved by numerous clicks, and you know as much of this language as I am able to give you. In 1896 a few of these people, copying the Maiye, adopted the village system and

cereal cultivation for the first time. The great bulk of them still exist on most primitive lines. They wander about the bush without cover, sleeping where they happen to be when the sun goes down, and eating what they find, mainly roots, snakes, and berries, as being easily acquired. In wet weather they place a piece of detached bark over the head, and leave the rest of the body to look after itself.

I entered the Mampukushu country proper, in $18^{\circ} 12' 42''$ S. lat., and about $21^{\circ} 25'$ E. long. About a century ago these people lived near the Katima Molilo rapids, on the Zambezi, in the heart of the Marotse kingdom, but were removed to the Kwando by Mwanabinye, governor of the Sesheke district, under his brother, the Marotse king,



MUKANDU-BANTU IN LUKAFU MARKET-PLACE, KATANGA.

for quarrelling with a neighbouring vassal tribe. Thence they followed the elephants to the Okavango, and have remained there till to-day. I met one chief, by name Monika, among these people who must have been about 110 years of age. When Sebitwane invaded the country, about seventy-five years ago, he was already a grandfather.

Lebebe is the title of the ruling chief here, and for generations the Lebebes have held an unrivalled reputation as rain doctors. I gave the present man a good wiggling for making so much rain when I was on the road to see him, and informed him I considered he had been guilty of a most unfriendly act. He apologized and assured me that had he known of my approach my skin would not have been wet once.

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A

There are some half-dozen rapids in the 70 miles of river passing through Lebebe's country, of which the Popa are the most important. In this stretch the banks are high, and the river no longer winds through the flat inundated plain already described. Passing through the Makwengari country—a people with a bad reputation, who had entrapped and murdered a white man, whom I met on his way thither, three years previously—I reached the confluence of the Kwito, which I traced for over 100 miles. Thence, since the natives informed me that the river made a considerable bend westwards, I travelled north, crossing many tributaries of the Kwando and its affluent the Luiana. There the country, to a very few miles of the Kwito, is drained by the Zambezi system. All this country, to the source of the Kwito in the north, is sparsely peopled by the Mambunda, a large, ill-organized tribe whose lack of unity renders them an easy prey to the more war-like Makwengari from across the river. There is also a tribe of bushmen, with whom these people live on friendly terms—I imagine for the reason that they give timely warning of the approach of Makwengari raiding parties. They are very light in colour, small boned, slightly made, but not unduly short. Their features are strikingly apart from the general rule. In many cases the lips recede like those of a toothless old woman, while the faces even of young men present a dried-up, wrinkled appearance. I struck the Kwito again in $15^{\circ} 7' 52''$ S. Lat., having travelled from where I last saw it, two degrees south, over high ground, rising to 4000 feet above the sea level, with a minimum temperature for some days of two or three degrees below freezing point. On several occasions my boys found ice on the water in the early morning. I was surprised to find the Kwito so large a river in these latitudes. It is about 80 yards broad, with a deep clear stream winding through a valley a mile wide, bordered by steep undulations 70 or 80 feet high.

From here I travelled in a north-easterly direction to the Kwando-Kubangui confluence, which I reached on June 2. To my personal disappointment I found Captain Quicke had left the day but one before. He, however, had acted wisely, for a chest and throat epidemic raged in the neighbourhood, and he feared an outbreak among his followers. Captain Hamilton had not been heard of, so I waited a week for him in vain. That week proved fatal to my original plans of travelling due north to the Congo-Zambezi watershed, and convinced me of the soundness of a theory which more than one such experience had compelled me to adopt. I had brought my caravan 1100 miles in little more than two months. Both chiefs and porters had behaved admirably, and had been free from sickness. Now, after a week's rest, during which they had become used to thorough laziness, time had been given them to think, and they had persuaded themselves that all they wished for was the indolence of village life. To attain this object my chiefs became almost mutinous, so after warning them of the possible result of their

conduct without effect, I changed my plan, feeling that I could do so without detriment to my work, and marched them straight into Lialui to be disposed of by their king. During these 300 miles they did all they could to get into my good graces, with a view to escaping the wrath to come, but failed. My advice, therefore, to those who wish to accomplish big journeys in Africa without worry or sickness, is, never rest for more than twenty-four hours at one place. Move quickly, but with regularity, and go straight through with your marches, camping, if possible, not later than three o'clock, for natives very much prefer an early camp to a long mid-day halt.

Lewanika was surprised to see me on June 27, and did not disguise his displeasure at the conduct of his chiefs. A week later I witnessed a most interesting trial. My two head chiefs were arraigned before a court comprised of about fifty second class chiefs, peers of the accused, and three first class chiefs—a grade limited in number, and including ministers, generals, and men of influence only. For want of time I pass on to the giving of the verdict. First the junior second class chief (as in our court-martials) gave his opinion and arguments to support it, then the next junior, and so on to the senior of the grade. But not so with the three big men. They were reputed men of strong character, who had the credit of possessing the courage of their own opinions, so (as with our High Court) the senior gave his verdict first, then the second senior, and the junior last. They were unanimously found guilty, and the finding was submitted to the king, who passed sentence, each of the accused being fined an ox. This is one of many customs entitling the Marotse to rank higher than savages. Captain Quicke came in on July 20, after having made a very good journey of some 1500 miles since our parting at Sesheke four months earlier. He had done everything I asked of him, and done it well, but I leave it to him to tell his own story. Here I received news of the fate of the steamer party Mr. Weller, whose health had quite given way, had been compelled to return home. Before leaving, however, he sent supplies to the Kafukwe in a barge, under care of a Portuguese trader, who undertook to forward them to Monzies, a British station in East Matokaland. The trader carried out his engagement, and Mr. Weller's accompanying letter reached me at Lialui.

The sad news of Mr. Muller's death from dysentery was confirmed. His loyalty had killed him, for, fearing that his comrades would be cut off from supplies, he made three attempts to follow with the disease still on him. The third time he got as far as Kashombe on his way to Zumbo, but had to be carried back to Tete in great pain, where he lingered for a few weeks and died. Had he thought more of himself and less of us, I am convinced he would have been alive to-day, and that the future would have seen him in a high rank among African explorers, for he had all the qualities to place him there. Captain

Alexander, with his taxidermist, had returned home. Captain Hamilton, after having been deserted by his porters on the Kwando, had sent one of his chiefs to Lewanika, who immediately dispatched a relief party. He arrived in the best of health and spirits, having added much to our map of Marotseland. Now, as I knew the steamers could not reach us, I abandoned the idea of returning home by the Lakes and Nile, for I could see little advantage in making a protracted journey through districts which had been tramped again and again by many explorers and others. Captain Quicke and I would go out by the west coast, and Captain Hamilton by the east on the completion of our work. Major Coryndon, however, arrived on August 12, and, after many arguments, persuaded me that even though there was little to be done geographically, I might make myself useful in other ways by taking the northerly route. Thus, on September 2, we ate a farewell dinner, hoping to meet in England not many months hence. Captain Quicke and I left the following day, he for the Kafukwe, then north for 250 miles, then west, passing south of the Zambezi, and crossing it at Nana kandundu, and thence to the west coast—a journey of over 2000 miles. I would follow the river to its source, thence along the Congo-Zambezi watershed eastwards, and then strike northwards for the Nile. Captain Hamilton and Major Coryndon were leaving for Chinde and Capetown respectively. It is with real pleasure that I acknowledge Major Coryndon's help and many kindnesses. Had he been a member of the expedition he couldn't have taken a greater interest in its welfare. Of Lewanika's friendly assistance it would be impossible to speak too appreciatively. Ever since he first gave me his assistance in 1895 he has promptly come forward with porters or canoes when asked to supply them, while his marvellous knowledge of the geography of his country has been a great help to me in maturing my plans of action. When I tell you that route-lines representing over 8000 miles have been necessary for the compilation of the map of Marotseland, irrespective of journeys to and fro, you will understand me when I say that without this chief's interest and aid it would have been impossible to have produced it in the time, from the work of two expeditions only.

I made the journey up the Zambezi by canoe, taking with me five donkeys—which were driven along the banks—as a reserve means of transport. In $14^{\circ} 35'$ S. lat. the low-lying plain gradually gives place to a bush country, studded here and there with *Borassus* palms. At a place called Gulwana the bank interested me owing to its uncommon geological construction. Slabs, 5 inches thick, which appeared to be a mixture of calcareous deposit and sandstone, occurred in several layers, with some 3 feet of white sand intervening. In one place these slabs, the sand having been washed clear by the floods, had broken off one above the other, and each one resting on the layer below gave the whole bank the appearance of having been roughly paved.

The Lungwebungu enters the parent river through well-wooded banks in $14^{\circ} 18' 42''$ S. lat., and is a much larger river than the Kabompo, which flows in 8' further north. The Zambezi in these latitudes is lined with trees which drop branches vertically downwards, and, like the banyan, they strike root in the mud below.

Except at the very lowest water there is no rapid between the Gonye falls and the Sapuma cataracts in $13^{\circ} 7'$ S. lat. Here the river flows in a torrent through a narrow rocky fissure into a pool of considerable extent. There is much limestone in this neighbourhood. For 10 miles above there are continuous rapids, from above which to a few miles beyond Kakengi ($12^{\circ} 24' 15''$ S. lat.) the banks are high, and on

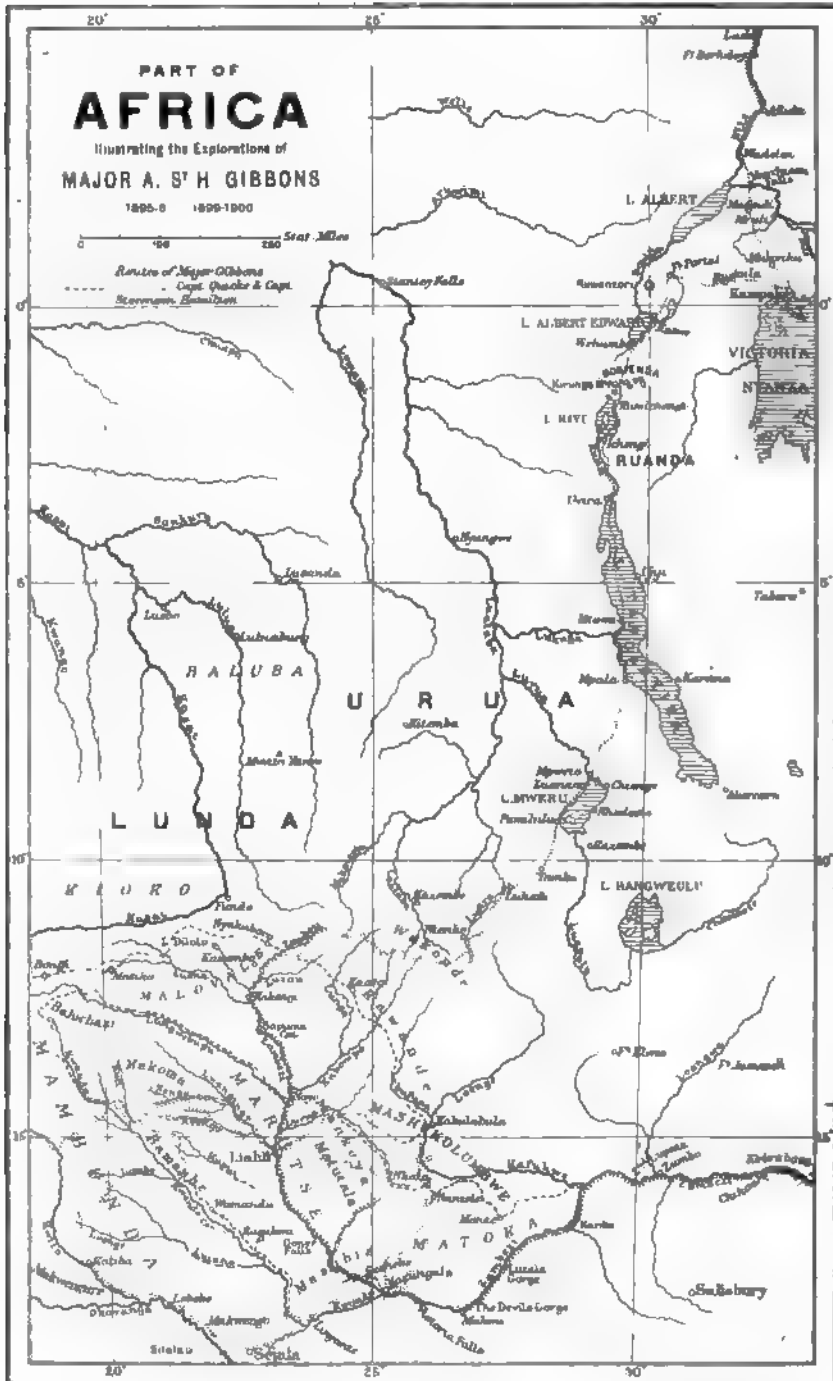


WEST SHORE OF LAKE MWERU, KILWA ISLAND IN LEFT BACKGROUND.

an average 850 yards apart. Here the river suddenly narrows to 100 yards and under, and is picturesque and tortuous. At Kazombo ($11^{\circ} 52' 43''$ S. lat.) there is a mission-station, presided over by Dr. Fisher, from whom I received the greatest kindness, as I did from Mr. Shindler at Nyakatoro (better known as Nanakandundu—rubber market—a name in use among the west-coast natives only). I made a land journey to this place in the hope of procuring porters, but failed. Many were willing to engage for the journey to Katanga by the trade route, but none could be induced to accompany me to the Zambezi source and thence eastwards; so on October 8 I quitted the canoes in favour of my five donkeys and four boys. The rains had commenced with a vengeance, and travelling through the pathless forest

Illustrating the Explorations of
MAJOR A. S^T H GIBBONS

Results of Meyer-Olson
Dept. Quacks & Capt
Stevenson. Evaluation



was far from pleasant, while the spongy nature of the bogs bordering the tributary rivers made work hard and progress slow, corduroying bogs and bridging streams becoming almost a daily necessity. As for the country, it was pleasant enough, but had been almost depopulated by the slave trade; it was of the usual open forest and undulating type, continually rising until the Zambezi source is reached in $11^{\circ} 21' 3''$ S. lat. and $24^{\circ} 22'$ E. long. approximately. The neighbourhood of the source, with an altitude of about 5000 feet, is replete with bracken to all appearance similar to our British variety. The river itself has its origin in a deep depression at the base of steep undulations, where the water oozes from a black marshy bog and quickly collects into a well-defined stream. Tall trees, closely interwoven with creepers and undergrowth, spring from this basin and continue for some half-dozen miles along the bed. All the rivers whose sources I visited in this district have a similar origin. I carefully examined every affluent near the source, and experienced no difficulty in following the main stream. Unlike the Congo and Nile, the course of the Zambezi is extremely well defined. Nowhere, from mouth to source, did I find an affluent which can in any sense of the word claim equality with the parent stream. It is interesting to note that the Zambezi, which in Burotse is known as Liambai, and in Lovale as Liambeshe, is called Yambeshe—a sound almost identical with its name on the lower river—in the first 100 miles of its course.

Only 6 miles east is the Lumpemba, running parallel with the Zambezi till the latter suddenly turns westwards. This stream is a tributary of the Lokoleshe, of the Congo system, having its source 3 miles south of the Zambezi. On November 9 I crossed the Kabompo a short distance below its source, which is probably not far from $11^{\circ} 34'$ S. lat., and $25^{\circ} 17'$ E. long. Three nights earlier lions had relieved me of one of my donkeys, and now a second was taken within a few yards of my tent. The marauder paid the death penalty the next day; but I was reduced to three donkeys, and had to lighten off accordingly.

Open grassy downs, at an altitude of 5000 feet, characterize the neighbourhood of the Kabompo headwaters. I found that the river marked Lualaba in the maps, but known by the local natives as Mualaba, rises just north of 12° S. lat., so that long yellow tongue inserted into British red ceases to exist. In fact, the watershed is always north of the twelfth parallel until within a short distance of the Luapula. When nearing the source of the Mumbeshe I overtook the Belgian expedition under Captain Lemaire. I was most hospitably received, and, since we were both bound for Lukafa, the principal Congolese station of Katanga, I gladly accepted Captain Lemaire's invitation to travel with him. We passed five pleasant weeks together, worked absolutely independently of one another, and had the satisfaction of finding that our maps coincided in all essential points.

The soil of this eastern section of the watershed and of Katanga is of red clay. I had left the white sand of the Upper Zambezi basin behind for ever. Iron is the predominating mineral, though a range of hills to the west of the Lufira contains valuable copper ore. In fact, Katanga means copper, and is the *white man's* name for the province. Two days before reaching Lukafu station ($10^{\circ} 31'$ S. lat.) I was knocked over with dysentery, and for the next two weeks was the recipient of much kindness and arrowroot from Captain Verdick, the commandant.

Captain Verdick having kindly supplied me with twelve porters, I left his station on January 6 and crossed the equator exactly two months later. My route lay through Mweru, Tanganyika, Kivu, and Albert Edward. It was an interesting journey, but of an easier character than any previous experience. I passed seventeen stations, i.e. on an average of one in rather less than four days, and, for the most part, travelled by broad roads connecting station with station. At Mpetu I had the pleasure of meeting Mr. Poulett Weatherly, and at Ishengi on Lake Kivu the German Doctor Kaudt, the work of both which explorers is well known to this Society. Between Kivu and Albert Edward the natives did not appreciate my presence, but they offered no violence, though they purloined my artificial horizon and a rifle. On approaching Albert Edward, I witnessed the misery famine and intertribal warfare can inflict on this unhappy race.

At Toro, in the Uganda Protectorate, where I was most kindly received by Mr. Bagge, the district commissioner, the latest papers reeked with the dismal news of Stormberg, Colenso, and Magersfontein, so I abandoned my intention of travelling down Albert Nyanza, and struck east to Kampala, intending to hurry to South Africa *viâ* Mombasa if more reassuring news were not forthcoming on my arrival. Happily the latest telegrams showed that the tide of fortune had completely changed, so after visiting Sir Harry Johnston at Entebe on Lake Victoria, I turned my face towards the Nile.

I purposely give a very sketchy account of this part of my journey, (1) because you have listened to a detailed account of Mr. Moore's work on the lakes a fortnight ago, and (2) because on leaving the Congo-Zambezi watershed, the principal objects of the expedition had been accomplished. There are, however, two points best mentioned. First, that the volcanic group to the north of Lake Kivu, locally known as Kirunga, are without doubt the Umfumbira (cooking range) mountains shown on the maps many miles to the east; and next that having seen the snowclad Ruenzori range, from an eminence 40 miles east of them, rising peak above peak to such a height as to make the snowline appear to be less than halfway up the mountains, I shall be much surprised if, when the altitude is definitely determined, it is found to fall far short of 20,000 feet.

I reached Lado four days too late to catch Major Peake's sudd-cutting

steamer, which left for Fashoda on May 8. Thus for three months I had to amuse myself as best I could. The country is flat, was inundated and uninteresting, while the mosquitoes were indescribable, and even the great kindness I received from Mr. Engh, the commandant of Lado, and his brother officers, did not compensate me for the trying inactivity of those three months.

Bimbashi Sanders, Governor of Fashoda, took me off in the *Kaibar* on August 7, and a month later I was in England. Not having received letters for fifteen months I was at times anxious about my two colleagues. Now I found they had done splendidly, having not only accomplished the work I had allotted them and reached their respective coasts in safety, but each had found his way to the seat of war, while Captain Alexander has been through the Ashanti war, and Mr. Weller had been to the West Coast and back since we parted. I have only one thing more to say, and I say it in proof of my opinion that there has been a great deal too much killing in Africa. During the last ten years my routes, added to those of my colleagues, exceed 20,000 miles beyond the reach of railroads, and mainly in the most remote parts of Africa of to-day, yet no one of us has found it necessary to take a single human life, and for my own part I would have no compunction in travelling again unarmed over any part of those 20,000 miles.

SUPPLEMENTARY JOURNEYS.

By Captain F. C. QUICKE.

AFTER Major Gibbons and Captain Hamilton had started on their respective journeys from Sesheke in March, 1899, with the kind help of Lewanika, who, owing to the floods, was at Mafula, a station at the edge of the plain, I reached the Nengo confluence of the Zambezi.

Leaving the Nengo, I followed the Luwe through a very pretty valley to its source. The natives here were very busy preparing rubber and making bark-cloth blankets. After passing through the hilly country and crossing the Chikolui and Kuti rivers, I arrived towards the end of May at the Kwando-Kubangwi confluence, where Major Gibbons had proposed we should meet. There was much sickness amongst the inhabitants here.

After a delay of twelve days of general unhappiness, I continued my journey up the Kwando to its source. Leaving the Kwando, I found great difficulty in getting my Marotse to travel any further from home. My path to the Lungwebungu lay over close hilly country some 5000 feet above the sea. There is practically no bird or animal life, the wandering Vachibokwe having long ago killed off anything that

might have existed. They are said to pursue to its extermination even the mouse, so highly do they prize meat. I found the Lungwebungu a great river, and very navigable, winding through an inundated plain 2 to 3 miles wide. The Valuchasi, who inhabited the upper reaches, were very homely. I used to enjoy their singing when gathered together in their villages before dispersing to their work at dawn.

Following the course of the river down to the Zambezi, I had a few days' good sport in the marshes after Lechwe. My headmen and followers behind me were put to flight by a snake—native name "Deruye," a black snake some 6 feet long, of the cobra type, that sat up and disputed our path until I had secured a spear. On another occasion I have been marvellously surprised by its wonderful vitality and strength. I cannot recommend any previous part of my journey to one of sporting proclivities. The country is hardly populated enough for missionary enterprise. The trader in rubber may succeed in future years if the rubber root still exists. Briefly, the main characteristics of the country may be thus described: Undulations, for the most part of white sand covered with forest, trees with very little foliage, no undergrowth, and intersected by rivers of clear water winding through flat alluvial valleys. These undulations rise in altitude and steepness as one travels west, until they may almost be described as hills.

On arrival at Lialui I found Major Gibbons full of fresh plans, forced on him through the conduct of his people.

On September 2 I bade farewell to my colleagues and to Major Coryndon, to whom, apart from his services to the expedition, I am personally grateful for many acts of kindness. First I followed the eastern Luena to its source, from some 20 miles east of its confluence with the Zambezi. I found the river larger than I expected from what I had seen of it near the Zambezi, which it enters in four separate streams. This journey was much pleasanter than my previous one. The Mankoya, untainted by intercourse with the Ovimbundu, are hospitable; like most tribes, they have their special little customs and characteristics. The women of this tribe had a most peculiar cry of greeting—I thought at first it was a cry of terror. The country is picturesque though dried up, bush fires having passed through the woods, charring the trunks and eating up the grass; dark firm soil giving place to the sand I encountered on my journey west. Game is to be found, and lions at one place were preying on the natives, who protect their villages with stockades. Above the Luompa confluence the chief Motondo, with his following and a large band of drums, received me in great state, and sat for hours, for these chiefs never take a hint to go. In his village, the variety of charms amused me, chief preference being given to an old elastic-side boot.

As we passed through the Bamashasha country it became flatter, the trees in the forest standing further apart, but absolutely shadeless. Here

game was very plentiful. Wildebeest and zebra in great quantities would graze in the river valley. After a worrying time with my carriers, I descended towards the Loenge, leaving the constant wind which always blows on the higher land behind me. In about 15° S. lat. I struck the Loenge—a fine picturesque river over a quarter of a mile wide, with slight rapids every 10 miles or so, and numerous islands. I found hartebeest, pallah, waterbuck, pookoo, the lesser reedbuck, bushbuck, and a small gazelle, of which I saw some twenty in one herd, but failed to secure a specimen. I enjoyed my journey up the Loenge immensely, in spite of the constant trouble my porters gave me; for two days they had their loads carried for them, and were driven along by twenty natives lent me by a friendly Mankoya chief. I reduced the chance of night desertion by collecting their bows, arrows, and spears, and later, when I entered Kawandi country, I was somewhat assisted through their fears of the Wakawandi, who often would follow us at a distance. The Lufupa, which I followed to near its source, was smaller, but very similar to the Luena river, *i.e.* a swift stream flowing between narrow banks among the hills, drying up entirely at places at this time of the year on entering the flatter valley. Where I left the Lufupa, I was treated in a friendly way by one Rundumina, who ruled over a cluster of villages, and owed allegiance to Lewanika. The people flocked in all day, and hearing I was fond of eggs, many aged and rotten ones were brought me. The country is high, and teems with white ants, bees, tsetse, horse, and other flies. The noise some nights was not caused by their moving to and fro, but by myriads of white ants simultaneously pecking at the dried leaves, etc., under cover of my round-sheet, making a sound similar to the scratching of a rat. These ants, as is well known, will not feed, except when hidden by something to protect them.

Journeying west, I crossed the Kabompo at its junction with the Mumbeshi. Proceeding up the right bank of the former river, I stopped at a cluster of Mambunda villages, their chief named "Muyanga." I joined him in a pleasant two-day hunting expedition, though one night we were all driven from our fires and brushwood shelters into the rain by the red army ants. These red ants have caused me more uncomfortable nights than anything else. A warm feeling over the arms and head is usually the first awakening; then a simultaneous attack over every part of the body necessitates a hurried flight and removal of every stitch of clothing.

After a twelve-day delay, during which I failed to get either a relay of porters or any information out of the natives, I started off with my Bamashasha in a north-west direction into country inhabited by the Valunda, a wretched, timid race. Then I reached a village, the chief of which, "Kaata," had Mambari visitors trading for rubber. They had come from Nyakatoro, and willingly gave me information, which

did not please my Marotse, who wished to go straight to Nyakatoro. They interrupted me, and were insolent. The Zambezi boy, my personal servant, seized my rifle; on looking round, after depriving him of it, I witnessed the funniest of sights: Kaata and his followers fleeing to their village, his stool upset, his gift of eggs broken, and the manioc flour strewn over the ground; my Bamashasha's backs disappearing in the bush; the Marotse hysterical, and my two Mambari friends calmly seated on their stools. Peace restored, guides were provided for a short way.

Crossing the Lunga one evening, which is a Kabompo affluent, but, nevertheless, a larger river, I noticed for the first time many fireflies, or beetles, giving the same light. I could gather no information, for there were but few inhabitants, and these we could not catch. Owing to the hills, the rains, and lack of food, my carriers became weak and knocked up, and, with the connivance of my Marotse, deserted one night. It was useless trying to go on, so, tired of being a slave-driver, I watched my Marotse pack up their belongings at dawn, and depart; but of course they returned, for they dared not show their faces to Lewanika, and were afraid to travel alone. Finally they took up most of my things, and I made straight for Nyakatoro, arriving soaked through one evening two days after at a Mambari encampment, rubber loads made up, ready to start next day for the west. They fled into the rain, but returned, offered me presents, and we travelled in company. I saw many earthworms for the first time, and in a locality where the white ants were abundant, as proved by the anthills and the constant falling of branches of trees rotten through white ants and sodden with rain. Then I crossed the Luzabo, and later the Zambezi. I was most kindly treated by Messrs. Cunningham and Harford and their kind ladies at Kavungu, a mission station near Nyakatoro, founded by Mr. Arnot, who had travelled this country fifteen years ago. From here I rode a mission ox on to Kazombo, a day's journey down the Zambezi, where Dr. and Mrs. Fisher had recently started a new station. I found Major Gibbons had left about a month before. The first week was a sad one for the little English colony. Dr. Fisher received news of his father's death; Mr. Coppethorne, a fellow-helper, sickened and died, and a lady of the mission was down with fever. The doctor had much to do, yet he took care of every little detail, the same care and attention being paid to the native sick. I would like to talk more of Dr. and Mrs. Fisher and his mission.

Travelling west with a caravan of Valovale—the most unlikable natives I have ever met—I passed through a flat country, jiggers especially favouring this low sandy soil. I met with many more here than when nearing the West Coast, but on entering the Vachibokwe country it became hilly and healthy. At the Portuguese stations of Kalunga, Kameia, and Mosico, the Portuguese officers were most

hospitable. As I passed west, ascending to country 6000 feet high, I stopped at several mission stations, everywhere receiving the greatest kindness. Then I descended into a tropical valley; and after crossing barren hills, Catumbella and the coast was reached. I arrived January 31, eighteen and a half months after leaving the mouth of the Zambezi. I took up my abode in a Dutch house, until a messenger arrived from Benguella, 18 miles off, from Mr. Bullough, offering me a passage on his yacht to the Cape. There are many convalescent and wounded officers and men who have since known that yacht; they would understand my experience on boarding her. I shall never forget the kindness I received. I found my Zambezi boy seated in a deck-chair, his loin-cloth discarded, and clothed in a suit of ducks, a yachting-cap on his head, and smoking a big cigar. Then I became sick, and I think Mr. Bullough and his friend, Mr. Mitchell, are responsible for my wearying you this evening.

Before the reading of the paper, the PRESIDENT said: We welcome here this evening once more our friend Major Gibbons, who read us a very interesting paper only a few years ago. He has now done, if possible, a still more important piece of work in the same region, and he has done it very thoroughly.

After the reading of the paper, the following discussion took place:—

MR. E. G. RAVENSTEIN: What we have heard to-night from Major Gibbons, and his companion, Captain Quicke, gives us a very imperfect notion of the very important work they have done. That will stand forth very prominently when their map is published; for the map of the Marotse country, tracing their journeyings, is based on numerous observations for latitude, and very careful itinerary surveys, and will prove a valuable acquisition, and one that will stand the test of time. I think Major Gibbons was right to concentrate his energies upon one particular district; it is no use wasting time on flying visits to all sorts of peoples, but as he had no return ticket he did quite right in choosing a different route for leaving the country to that by which he had entered. And the route he chose is one of the most interesting; it took him along Lake Tanganyika, through the African "Interlaken," through Uganda and the Sudan to Egypt. Now about Tanganyika. Up till a few years ago, the lake was delineated in accordance with the map published by the R.G.S. in 1882. Well, at that time, so far as the south of the lake is concerned, we had one trustworthy longitude observed by a Belgian officer, Cambier, who left his theodolite at Karema, where it may be still. On that observation, and a rough triangulation made by Mr. Hore, and the more detailed information collected, and many latitudes, observed by men like Livingstone, Cameron, Joseph Thomson, and above all Stanley, the southern portion of the lake has been delineated, and has stood the test of time. In the delineation of the northern part of the lake we were still dependent upon fragmentary and unsatisfactory information. Mr. Fergusson has recently determined a number of longitudes, and he places the northern extremity 10 or 11 miles further west than the map of 1882. Dr. Baumann, who observed a longitude close by, shifted it 3 miles; but far greater differences exist in the middle of the lake in relation to its eastern and western coasts. Ujiji, according to different observers, varies 31' in longitude, and Plymouth Rock, the missionary station on the western side of the lake, varies

as much as 45'; and whilst on the old Society's map Usambara lies 11' to the west of Ntowa, on the new map of Mr. Fergusson these two spots are on the same meridian. I am not prepared to say who is right, but I am happy to say that an International Expedition is now on the spot to do the work which ought to have been done before boundaries were laid down and treaties signed, and it is certain to settle this question. I am confident, having seen Major Gibbons' map, that whatever change takes place in the longitude of Lake Kivu, which was first heard of by Livingstone, miles away, there will be no change in the relative position of these volcanoes from that assigned to them by Major Gibbons. It is satisfactory to find that not only Major Gibbons, but Mr. Fergusson, and I think Mr. Grogan, place Fort George in the position assigned to it by Stanley. I think it must be a great satisfaction to him to find his observation stand the test of time. It is a most important position, for the fort lies very near the boundary separating the so-called Congo State from the British sphere. One other point is that Major Gibbons proved, to my special satisfaction, what I always believed, that Lake Ruisamba extends far to the north, just as Stanley, Lugard, and others found, notwithstanding that one explorer unceremoniously obliterated this extension from a second edition of a map which I had prepared to illustrate his explorations, all the other features of which he retained. I think we are very greatly indebted for the very valuable information we have received.

The PRESIDENT: Prof. Gregory's name was taken in vain a fortnight ago, when he was on his way home; now he is once more with us to-night, and possibly he may wish to say a few words on the subject of the paper.

Prof. J. W. GREGORY: It was only to-night that I heard of the criticisms recently passed on the joint paper by Mr. Scott Elliot and myself. As I do not know what they were, it is impossible to reply. I should like on this occasion to express my high admiration of the magnificent survey of Major Gibbons. One point especially interested me; I was asked some years ago to explain the formation of the Victoria falls, and the only explanation I could arrive at by a study of the maps had one weak point—it wanted more water than at present flows over the falls. If the upper Okavango had at one time entered the Zambezi, it would have remedied that difficulty. Major Gibbons' paper bristled with points of great interest, but at this late hour I can only express the pleasure with which I have listened to it, and congratulate him on his magnificent contribution to our knowledge of one of the most interesting regions in Southern Central Africa.

The PRESIDENT: I can assure the meeting that Mr. Ravenstein and Prof. Gregory have not said a word too much or spoken too highly of Major Gibbons' work. He set before himself a geographical piece of work, which he determined to carry out thoroughly. He has done so during two long expeditions. He has told us that his objects were to ascertain the value of the Zambezi as a fluvial highway. He has done that very completely and very thoroughly. He has told us, also, that he wished to form an accurate knowledge of the resources of the country he went to explore; and his third object, to us the most important, was the geographical survey of that interesting country the Marotse. He has done that by going over routes covering at least 8000 miles, not only with a compass route survey, but also by numerous astronomical observations. I therefore look upon Major Gibbons as the type of a very excellent modern explorer, doing thorough and valuable work over a fixed area of land. To-night we have to thank him also for a most interesting paper, and for the illustrations which accompanied it. In asking you to pass a unanimous vote of thanks to Major Gibbons, I would desire to include his gallant companions, who are present this evening.

FROM ALGERIA TO THE FRENCH CONGO.*

By M. F. FOUREAU.

[AFTER a brief introduction describing the origin and organization of his recent journey across the Sahara, towards the expenses of which the proceeds of the Orgeries legacy were voted by a committee of the Paris Geographical Society, M. Foureau proceeded as follows:—]

All having been satisfactorily arranged, we left Sedrata, the final point of departure, on October 23, 1898. Besides its leader, the mission included four civilians, MM. Dorian, Villatte, Leroy, and Du Passage; while in addition to its commander, Major Lamy, the escort comprised Captain Reibell, and nine other officers, including Drs. Fournial and Haller. The force numbered about 280 men at starting, and the convoy of camels more than 1000.

I will not stop to describe in detail the various branches of scientific work carried out during the course of the expedition. Suffice it to say that I executed a route-survey of the whole line of march, took 512 astronomical observations for the fixing of the more important positions, and made a collection of geological specimens which will throw light on the structure of the regions traversed. The results, together with those relating to meteorology, botany, and ethnography (the two last the more special work of Dr. Fournial, assisted by Dr. Haller), will eventually be published.

Passing over our journey across the great dunes, our stay at Timassanin, and our march across the northern Tassili, I will take up my story at Ain El-Hajaj, the point at which our actual plunge into the unknown began. The route pointed out by the Azjer led by the Wad Samene, but before taking this we examined the country to prove whether no feasible passage existed more to the west. We then attacked the mountain *massif* of Tindesset, the crossing of which occupied four days, rendered memorable by the difficulties of the route. Frowning peaks of sandstone blackened by the weather rose before and around us, and in these grand but gloomy surroundings we seemed like an army of ants attacking one of the pyramids of Egypt. Everywhere were rugged ravines, while a fine cascade—waterless, of course—dropped some 70 feet from its rocky ledge to the lower basin of the Wad Angarab. This rocky chaos ends suddenly to the south in a giddy descent, by which a zigzag, rock-strewn, path leads down to the plain below. We pitched our camp in the Wad Ujidi, at the foot of some high masses of rock covered with ancient Tuareg inscriptions, while close by were some

* Abridgment of paper read at the Paris Geographical Society, December 5, 1900, and sent to the R.G.S. by M. Foureau. The illustrations have been kindly lent by MM. Masson, Publishers, Paris.

enormous tombs, which the native legends report to contain treasures. Still passing through a mountainous but easier country, we reached Afara, a spot dominated by the high southern escarpment of the Tassili, where (on January 1, 1899) we experienced a frost which might have made us suppose we were in France. The cliff stretched its fantastic outline along the whole northern horizon, presenting the appearance of cathedrals, obelisks, towers, and all sorts of enormous structures with geometrical outlines.

Here we were joined by our two Tuareg guides, and though the information as to the watering-places on our way was far from clear, we felt that we were really *en route* for Air. We soon began the passage



OUR VANGUARD ON THE TINDESSET.

of a mountainous region called Anahef, composed entirely of quartz and granite, and formed by a series of mountain ranges and rugged plateaux cut by river-beds strewn with rocks. Crossing here the line of partition between the basins of the Mediterranean and Atlantic, we camped at a spot called Tadent, whence, with Lamy, Dorian, and Leroy, I made a five days' excursion to the well of Tajenut, the scene of the massacre of Colonel Flatters and his companions. This excursion proved very trying, both from the rapidity of our march and from the difficulties of the country and the want of water. We passed through the wild and imposing gorges of the Obazzer river, and crossed a region of schists and granite, the sad and desolate aspect of which can scarcely be imagined. The vast masses of Zerzaro, Sodderai, and Serkut rose with seamed and jagged surface above the barren and inhospitable plateau.

From Tadent we soon reached the interminable plain so well likened by Barth to a rock-strewn sea, which the Tuareg call Tiniri. The level expanse of quartz gravel is strewn with blocks of granite, rocky

bosses, and bare and arid lines of hills, the whole devoid of water and vegetation. The camels dropped one after another, adding their bones to the many which mark this terrible track, on which we seemed to be always marching without ever reaching our destination. At last, however, we did reach In-Azaoua, where, owing to the mortality among our animals, we were forced to leave a portion of our loads, more especially as we had just received a convoy of dates escorted by Lieut. de Thézillat, who here joined our party. Fifty men of our escort were left with the baggage in a stone fort, to wait until they should be fetched away by Major Lamy. At In-Azaoua, which has taken the place of the celebrated well of Assiu, now dry, the last link binding us to France was broken, the last couriers sent after us by Captain Pein reaching us here, and taking back our last despatches for the north. Apart from two official telegrams which reached us at Zinder, I received no news from home until seventeen months later on arrival at Brazzaville.



GORGE OF THE ORAZER.

A march of eleven days brought us to Ifernane, the first village of Air, situated in the valley of Irhazar, one well only, that of Taghazi, having replenished our water-supply in the interval. The country consists chiefly of quartz, granite, and gneiss, often presenting rounded shapes. It is intersected by broad river-beds, all directed towards the west, and to these the vegetation is confined. Gazelles and antelopes are abundant in them. The inhabitants of Ifernane, which is an unimportant village with a few gardens and palm trees, are Kel-Ui Tuareg, and their slaves. The chief, El Haj Mohammed, who remembers both Barth and de Bary, received us courteously. He showed me a piece of carpet which I had presented some years before to Gidassan, sultan of the Azjer.

East of Ifernane rises a chain of high mountains, named Tinge or Tengek, composed of steep, rugged, and bare peaks, furrowed by deep and narrow valleys. In the morning and evening these mountains displayed marvellous colouring, affording us a splendid panorama.

We were now in great straits for want of baggage animals. Major Lamy, who had returned to In-Azaoua to fetch on the detachment left there, was obliged to burn a large quantity of barter goods, dates, etc., a necessity which unfortunately recurred, for our stock of camels was melting away like wax. On March 12 an attack was made on our camp by a band of 400 to 500 Tuaregs, who were, however, beaten off with loss, and we gained possession of some animals abandoned by them. Our provisions were likewise exhausted, and it was with difficulty that we could procure millet or sorghum—which, with the flesh of the sick camels and occasionally a little milk or cheese, formed our only food. At this period (March, April, May) dry tornadoes were frequent, and the heat great. To wait would have involved death from starvation, so we decided to make a step forward, taking with us all that our remaining animals could carry, while the rest of our goods were left under the charge of Captain Reibell, with a portion of the escort. On May 26 we reached, after a march of some 30 miles, the village of Agellal, situated at the foot of one of the Air ranges, at a point where the narrow mountain ravines spread out into a wide river-bed covered with fine gum acacias. Here we pitched our tent in an impregnable position on a sort of island formed of granite blocks. The village had been abandoned, its inhabitants having taken part in the attack on our camp. Some camels and other animals, belonging either to them or to other tribes implicated, fell into our hands during reconnaissances made in the neighbourhood. During one of these, a part of our escort was attacked by a body of 700 to 800 Tuareg, who were, however, soon put to flight. On the body of one of the slain we found a Koran containing some fragments of paper, which, from the figures and characters written on them, had undoubtedly belonged to the traveller, Erwin de Bary.

Thanks to the captures thus made, our camp was now a veritable menagerie, but besides meat we had still no food, and it was necessary to move on. On June 11 Major Lamy brought in the detachment from Iferuane, but, our remaining animals being insufficient for the transport of our goods, we were compelled to sacrifice all that was not absolutely indispensable. Clothes, beds, tents, books, photographic apparatus, etc., etc., were all burnt, a portion only of the powder and cartridges being kept. This having been done, we once more set ourselves in motion, and, after a slow and painful march of ten days, reached the village of Auderas. Here, in spite of friendly letters sent by various chiefs of the Kel-Ui, we were still unsuccessful in our attempts to obtain animals. Our immediate needs were met by a supply of food sent for sale by the sultan of Agadez, who would have liked us to continue our route to the south without passing his capital. We thought otherwise, so, after a halt of seventeen days, we decided to march on Agadez, after having, on July 14, in spite of our painful circumstances, organized a *fête* for our

escort. Songs, recitations, and a burlesque acted by native *tirailleurs*, helped to fill up the programme.

We had now with us two Tuareg personages deserving particular mention. The one, Akhedu by name, rendered us great services as interpreter and go-between, both at Auderas and Agadez. The other, named Mili-Menzu, was the chief vizier of the sultan of Agadez, a trustworthy and energetic man, who always showed the greatest devotion to us, and acted as our chief guide from Agadez to Zinder, besides doing other valuable work.

Between Auderas and Agadez the way leads first among the mountains, with a hard and rocky soil, and some rather difficult passes. Afterwards the lines of granitic hills become lower, and are separated by verdant valleys in which the dum palm is the principal tree. The



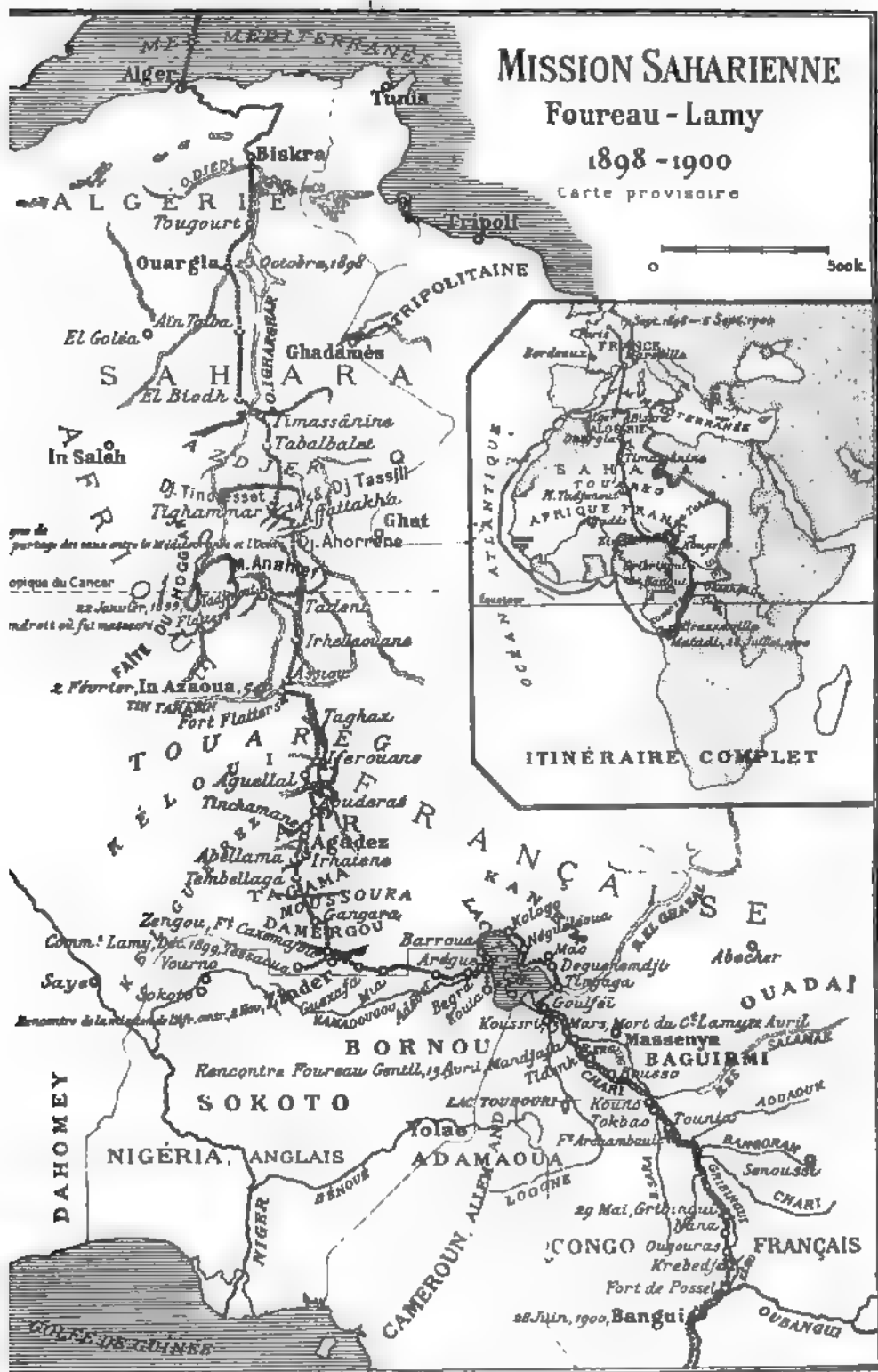
TUAREG GUIDES.

country becomes more and more open, forming a plain, more or less covered with gum-trees, in which Agadez is placed. We arrived there on July 28, and pitched our camp on a small rising ground, in the centre of which is a copious well named Tinshamane. The town has a dreary appearance. Its area is considerable, but more than half is covered by ruined houses. Those which are intact are built of clay, and many have an upper story. A few are quite stylish, all of these belonging to people from Tuat or Tripoli. The abode of the sultan, which has an upper storey pierced by small regular windows, has no architectural merit. It is a massive building, and the projecting beams of the different floors give it an odd bristling appearance. Near it is the mosque, the high minaret of which still remains as in Barth's time.

A market soon sprang up just outside our camp, at which were sold, in addition to a few oxen now and then, a large number of sheep and

goats, guinea-fowl, poultry, pigeons, ground-nuts, millet flour, dry cheeses, beans, a little sour milk, and some excellent tobacco brought from Kano and Katsena. In spite of the sultan's protestations of friendship, our daily supply of millet was obtained with the greatest difficulty, and threats had constantly to be employed. We obtained from the sultan a few camels and donkeys, but, finding that his power was extremely limited, and shared with other important chiefs, we decided to set out with the supplies we had for Zinder, whither we directed our course on October 10. The sultan supplied us with a guide, who, we were told, would conduct us each day to a water-supply. We were soon undeceived, however, for at the first halt we found only enough water to give a glassful to each man, and none at all to the animals, while the next day pools of rain-water were only found after a long search, near the hills of Irhaïen. Our guide seemed to be purposely leading us gradually round to the north, and there was nothing for it but to make our way back to Agadez, where we arrived after an absence of ten days, during which the position had been more dangerous than ever before. This march, made under a high temperature by men heavily loaded, without a drop to drink, and mostly walking barefoot, has hardly a parallel in the history of exploration.

We were now in a sorry plight, and the ragged condition of our *tirailleurs* almost beggars description. Our second stay at Agadez brought no change in the attitude of the local authorities. Vigorous measures were necessary, and our end was only attained after the seizure, by our escort, of the two wells which supply the town, upon which we obtained a hundred camels and a few donkeys. We finally left Agadez, under the guidance of Mili Menzu and one or two others, on October 17, 1899, making our way by long and rapid marches across the districts of Azauakh and Tagama. Azauakh is a desert zone, bare and arid, marked by small outcrops of reddish sandstone. Tagama, which in the Tuareg language means forest, is everywhere covered with bush of greater or less density, broken here and there by treeless patches. These, as well as the ground beneath the trees, are carpeted with *graminæ*, the most abundant species, named *karenjia*, being greedily eaten by the animals, though quite a plague to travellers by reason of the invisible spines with which the covering of the seed bristles. The *karenjia*, to which Barth devotes several pages of his work, is met with as far as the lower Shari. The scrub consists chiefly of dwarf gum-bushes, with here and there larger trees, especially a leafy species of *Ficus*, closely resembling the chestnut in appearance. The abundance of game in Tagama is incredible. It includes three or four varieties of antelope, wild boar, lions, giraffes, partridges, guinea-fowl, etc., many of them very tame. Damergu is much more open than Tagama, displaying small patches of wood and immense fields of millet, which had been reaped at the time. At Gangara, a large village in Damergu, we joined



our vanguard, which had preceded us by two days under Major Lamy, and then, after passing through several other villages, arrived at Zinder. By this time our numbers had been swelled by the addition to our company of many negro women, mostly slaves who had fled from their masters in the hope of regaining their homes, and of whom many found fathers, mothers, and brothers in various villages of the Sudan. Most had attached themselves temporarily to many of our *tirailleurs*, whose board and duties they shared.

At Zinder we found a detachment of 100 Senegalese under the command of Sergeant Bouthel, who formed the garrison of the place. They were the only remains of the Voulet mission, Lieut. Pallier having started for the Senegal, while Lieuts. Joalland and Meynier had proceeded to Lake Chad a month before our arrival. As our escort, ragged but full of ardour, filed before them, to the salute of the two flags and the bray of trumpets, it was a moving and inspiring spectacle.

Zinder is a large and fine town, surrounded with high earthen walls very thick at the base and pierced with seven gates. The town covers a large area, and its houses are in part built of clay after the style of those of Jenne so well described by M. Dubois, in part of straw, and furnished with small courtyards enclosed with high mat walls. The palace of the *serki*, or sultan, occupies a large space, but is also built of clay, and has no artistic merit. The pleasing aspect of the town arises firstly from the variety of form of the houses and the irregularity of the ground, and secondly from the presence of trees and bushes, including the *alinka*, baobab and borassus palm, scattered at random over its area. A whole section is occupied by a pile of rocks and blocks of granite rising higher than the walls and commanding a fine view over the place. Outside, not far from the wall, is the French post, Fort Cazemajou, on a mound of huge granite blocks. It was presented to France by a Tuareg merchant, Mallem Yaro, a remarkable man who proved exceedingly well disposed, and rendered us valuable services. His present residence is at Zengu, the Tuareg suburb of Zinder. It serves also as a warehouse, and in it I saw, in the midst of cottons, silks, ostrich feathers, spices, etc., a variety of unexpected articles, such as French scent-bottles, Arab bon-bon boxes from Tunis, bottles of Hunyadi Janos water, and cages of live civets, from which the musk is extracted weekly.

It was through Mallem Yaro that I despatched a courier with letters for France on November 3, 1899. These despatches I supposed to be lost until, on October 23 last, they were placed in the hands of the French Consul-General at Tripoli, who obligingly forwarded them to me. They had thus taken a year to reach their address, but the fact that they did arrive shows the trustworthiness of Mallem Yaro's agents.

In front of one of the gates of Zinder there is a market formed of

rows of sheds divided into little shops. A little of everything, from cottons to tobacco, jewels, salt, kola-nuts, etc., is sold here, by negresses seated in parallel lines. The wares even include appetizing dishes of meat broiled on the spot. The scene at this market is an animated one, especially about four o'clock, when the going and coming is incessant. The scavenging of the town and market is the work of the numerous vultures, of a species distributed, like the various kinds of turtle-doves, throughout the whole country from Air to the Congo.

During our stay at Zinder, Major Lamy with half the escort carried out an expedition towards Tessaua, for the purpose of enforcing the obedience of certain recalcitrant chiefs. He collected, either as tribute or as fines, nearly 300 horses, and as we were also furnished with 100 camels, by a section of the Kel-Ui, we were in a position to continue our journey. I was pleased to find at Zinder a telegram from the Minister of Public Instruction, authorizing me to choose my own route for the return journey; and I did not hesitate a moment to order an advance eastward, as the original programme had in view, besides the crossing of the Sahara to the Sudan, the journey from the latter to Lake Chad and Kanem, and eventually the junction with M. Gentil on the Shari. On December 27 we performed the last obsequies for the remains of Colonel Klobb, which had been brought in by Major Lamy after his journey to Tessaua, as well as for those of Captain Cazemajou and his interpreter Olive, which had been previously rescued from a dry well into which they had been thrown.

On the 26th Major Lamy had set out with the first detachment, and on the 29th I followed with the remainder of our escort under Captain Reibell. We joined hands with the advance guard on January 9, 1900, at the villages of Adeber, and did the rest of the march together. The country, here named Manga, contains some fine villages. Thin bush alternates with clumps of trees and wide grassy plains, with numbers of swamps impregnated with carbonate of soda. These depressions are always surrounded with Dum palms. Much salt is extracted from the mud and water of these lakes, and is used throughout a large area. The producers do not cultivate the ground, but exchange the salt for millet. From Adeber we marched through grassy plains, dotted here and there with tamarinds, to the Komadugu Yobe, which contained a narrow stream of water, and of which the banks are everywhere covered with a thick belt of forest. At the village of Begra, on its banks, we found the sheikh Ahmar Sinda, son of the sultan of Bornu, dethroned by Rabah. We were present at his investiture as the new sultan of Bornu, in which a number of chiefs from all sides took part. He had just arrived from Zinder, and seemed to rely on our aid alone for the recovery of his throne. He never left our side, and was still with the escort when I finally left for France.

During all this time our supplies of food were extremely limited,

millet being very scarce in the salt-producing country. We often went hungry, and I well remember my delight at discovering one day, in a box of other articles, some small tablets of chocolate, which seemed to us, long deprived as we had been of sugar in our diet, as food fit for a king. Our wretched animals were still strewing their bones along the road, their only food being dry grass, which supplied very scanty nutriment; and in regard to food-supply, our situation became daily worse until we reached Kusri. All the villages along the Komadugu had been pillaged and burnt by the bands of Rabah, and heaps of human bones lay whitening on all sides. Even Kuka, the former flourishing capital of Bornu, with its hundred thousand inhabitants, had come off no better, being now nothing but a melancholy heap of ruins. Crumbling walls already covered with creepers, trees growing up in the interior of the houses, thousands of earthen jars, broken or whole, are all that meets the eye in the once proud queen of the Sudan.

It was on January 21, near the village of Arege, that I had my first view of Lake Chad. At this point the lake was fringed with reeds, but openings permitted a clear view of the open water gleaming in the sunlight, and enlivened with large numbers of birds. Above high-water mark the ground was cultivated with cotton, a little of which is generally seen in similar situations. Further south the road skirts the edge of the open water with no reed-barrier, and we observed a considerable swell, which indicated a certain depth. The water is fresh and good to drink. The area between Kuka and the lake, and the whole northern part of this region, abound in large game, including elephants, which showed themselves very tame. Our route now led in a circuit round the shores of the lake, and we passed by Barrua, Wadi, and Negigmi. The huts of this last village were intact, but had been abandoned by reason of the frequent raids of the Ulad Siman and Tebus. Further on we touched at the watering-place of Yarra, and beyond this at the village of Kologo.

Above high-water mark, round the whole north-west and north of Lake Chad, there is a continuous chain of gently sloping sand-hills covered with bush, and forming the virtual shores of the lake. The ground is everywhere strewn with the remains of huge fish, and the whitened bones of hippopotamus, crocodiles, and elephants. Game simply swarms, and on one occasion the troops of antelopes occupied more than ten minutes in galloping past our encampment. Giraffes, lions, and rhinoceros are also abundant. On the west side we had seen some canoes of the Chad islanders, the Buduma. These canoes are made of bundles of reeds tied closely together, and, though heavy, are unsinkable, albeit the crew are practically seated in the water. The form is that of an ordinary undecked boat, with an elevated prow. The Buduma are thorough-going banditti, making slaves of all the stragglers they can lay hands on to sell on the opposite shore.

Beyond Kologo our route took a decided bend to the south-east. We now left the shores of the lake proper, which here split up into a number of lagoons, running with winding contours far into the land, and compelling us to make wide *détours*. Not until the villages of Negelewa did we catch sight, and that for the last time, of the shining expanse of Chad, here studded with islands. Beyond this we entered Kanem, the principal cases of which lay to the east of us. At Degenemji, near Neguri and Mao, we fell in with Lieut. Joalland, who had come to meet us with thirty horsemen from his camp at Gulfei, on the Shari, to which a rapid march of five days now brought us. Our junction with the old Voulet mission was thus effected.

During these five days we had first to cross level plains, now covered



WATERING-PLACE AT YARRA, ON LAKE CHAD.

with tall dry reeds, but inundated in the wet season, and then to follow the margins of a series of lagoons, obscurely connected with the lake. Further on the plain became undulating, and was varied with patches of wood, with occasional large sycamore figs and numbers of the *teboraq*, a tree which we had constantly seen since reaching the northern Sahara, and which continued with us as far as about 7° N. The natives use its bark for soap, and eat the slightly bitter kernel of its fruit. In this march we had crossed the region named Bahr-el-Ghazal on our maps, which must not, however, be taken for a river, nor is it by any means an effluent of the lake, as some have imagined, but merely a sort of lagoon or narrow gulf, along which, according to native statements, the water, at times when the lake is unusually full, extends some 40 miles into the land. Beyond, the bush thickens, with clumps of large trees (tamarinds, etc.), while anthills are seen on all hands. The country is cut up by numbers of dry channels, with black soil fissured by deep and

wide cracks. It is plain that the whole is covered in the rainy season by an overflow from the Shari and the very numerous branches of its delta. The thickets are the haunt of game of all kinds, from guinea-fowl to rhinoceros, the latter being very abundant.

At Gulfei the Shari is a fine river, and although it was the season of low water, its bed had an imposing width. We stayed but a short time, but soon afterwards halted three days at Mara, where we crossed the river, the men passing over in canoes. The transport of our animals occupied nearly two days, and resulted in the loss of a certain number. On the other side we continued our way to Kusri, an important town at the junction of the Logone with the Shari. The place was strongly held by a detachment of Rabah's army when, on March 2, the expedition encamped within a few miles of it. After a night's march through the bush, Major Lamy made a brilliant assault, and took possession of the place at 3 a.m., the enemy losing heavily both in men, arms, and supplies.

Rabah and his forces were in occupation of Gulfei, Karnak-Logone, and Dikoa, but we received the most contradictory reports of his movements. His army was well organized, the marching regiments being supplied with information by mounted scouts. In battle, the guns and cartridges of the killed and wounded are collected by negro archers and lancers. The empty cartridge-cases are refilled by his armourers, and are very deadly when used. As soon as we were installed at Kusri, troops of natives began to arrive in large numbers, camping round the town, with the object of gaining our protection against Rabah. The number of these people who stationed themselves round Kusri in the space of a month may be estimated at at least 10,000 to 12,000, their flocks reaching a total of 157,000 head of oxen, sheep, and goats. They all belonged to the various sections of the Shuas—a light-skinned race of oriental origin, widely distributed throughout Bornu and on the eastern bank of the Shari. Their proper language is Arabic, which all speak more or less, though commonly using the speech of Bornu and Bagirmi. The women are well made, with delicate features, and show no appreciable trace of negro blood. Their hair is long, and divided into a number of fine tresses, while a larger one behind is sometimes formed into a coil. They all wear round the hips a number of strings of large white and blue beads. The towns of the lower Shari—Shauï, Gulfei, Mara, Kusri, Karnak-Logone, and some others—are inhabited by a race of fishers named Kottoko. These people are of a deep black, with woolly hair, but, though ugly (especially the women), are well-made. They fish both with nets and with the harpoon, and their canoes are made, for this purpose, extremely stable, about 40 feet long, and 5 or 6 feet broad at the stern, the bows running out to a high point. A huge net, supported by two enormous antennæ-like spars, is fixed at the stern and worked by a great lever. It is let down until it almost



FISHING-BOAT ON THE LOWER SHARI.

touches the bottom of the river, when the canoe is moved slowly along, the water being at the same time beaten by two boys in a smaller canoe. The net is then raised, and the fish fall into the large canoe. The rivers abound in fish, and the takes are usually good.

Kusri lies some 30 feet above the Logone, the houses reaching close to the bank. They are solidly made of clay, generally rectangular, but occasionally cylindrical, with thatched roofs supported by a framework of stout poles. Some of the rectangular form have upper stories, but all have very small entrances. Many possess beehives, arranged much after the fashion of those kept by the Kabyles of the Aures, and hives are also placed in trees, both in the towns and in the bush, where wild bees are very abundant.

We had not yet received replies to the despatches sent to M. Gentil, but had heard from Captain de Lamothe, who commanded his advance party, and who was now at Masere, a town of Bagirmi, not far from the old capital, Massenya. We thus learnt that the whole Gentil expedition was descending the Shari to join us. Meanwhile sixty camels and a score of canoes were sent by Major Lamy to M. Gentil to facilitate his advance. The Sahara expedition had finished its task, and its escort was henceforth at the disposal of the Government Commissioner for any military operations that might be deemed necessary. I therefore set out on April 2, with the canoes and thirty men, and on the 11th met M. Gentil at Manjafa. This meeting stirred us deeply, and nothing was wanting to the impressiveness of the occasion. Advancing through a country made known by his own efforts, Gentil was brought face to face with a compatriot who had set out from the opposite extremity of French Africa, and the last link of the chain connecting the Mediterranean with the Atlantic was now complete.

With an escort, canoes, and a guide kindly provided by M. Gentil, I resumed my ascent of the river on April 14, the Gentil expedition continuing its route to Kusri. For three months and a half I was entirely without news from my rear, and it was only at Brazzaville, on July 21, that I learnt the sad news of the death of Major Lamy. Not till much later, after my arrival in France, did I hear of the brilliant operations, conducted by Captain Reibell, which had led to the complete rout of the army of Rabah.

On my voyage up the Shari and Gribingi, which lasted fifty-six days, I had with me Vilatte and the four Shambas from Wargla, who had served us so faithfully ever since we left Algeria. The voyage was a monotonous one. The water was low, and we were at times reduced to the necessity of dragging our canoes over the shallows. Our slow rate of progress allowed the Shambas to land frequently for a hunt, and game was so abundant that our larder was kept constantly replenished. The rainy season was now beginning, and we were visited by frequent tornadoes, which raised big waves, and forced us to take refuge beside the bank. At these times the crew would jump overboard, remaining up to their necks in the water, and covering their heads with an inverted calabash until the storm abated; the reason for this behaviour being that the temperature of the water would be about 86° Fahr., while that of the rain would be scarcely higher than 75°.

Besides innumerable hippopotami, crocodiles, and antelopes, lions and rhinoceros occur in large numbers. Certain districts along the Shari swarm with elephants, and one night, when encamped on a sand-bank, we were surrounded for two hours by a whole troop of these animals, who paid little heed to our feeble camp-fires. Only a short time ago the banks of the river were lined with fine villages, but all



PASSING THE GRIBINGI RAPIDS.

had been destroyed by Rabah's forces. The inhabitants had in part dispersed over the bush, but some had built straw huts either on the shore or on sandbanks, whence they prosecute their avocation as fishers during the period of low water. Even at this season the Shari is a fine, wide river, whilst at high water it becomes a majestic stream, with a width, in places, of 4 to 5 miles. It spreads, besides, over the plains on either side, forming innumerable lakes and backwaters. The ultimate banks are marked by tall bush, which acquires a more tropical character the further south one ascends. Only one station—that of Tunia, or Fort Archambault—has been established on the stream.

On leaving the Shari proper and entering the Gribingi, the scene



SUSPENSION BRIDGE OVER THE GRIBINGI.

changes. The latter river hardly exceeds a width of 60 yards at the confluence, while at the Gribingi station it is little more than 20 yards wide. It is broken into various sections by rapids, which at the time of our passage carried very little water, and often involved difficult portages. At high water these spots are marked by violent eddies, due to the force with which the water dashes against the submerged rocks. The bush, which alternates with open spaces, is enlivened by a variety of birds and monkeys, while the river view is varied by precipitous rocks and sharp bends. The current is frequently obstructed by fishing-weirs, which the natives construct by throwing large trees across the stream, and fixing wicker traps in openings among the submerged branches. It was with difficulty that I could restrain my men from visiting these traps and appropriating their contents. On the upper course of the river we came upon several picturesque bridges, formed of lianas stretched between trees on either bank.

At the Gribingi station we left the canoes, and proceeded by land

for a distance of nearly 200 miles, I riding on an ox, while our baggage was carried by porters. The rains were now in full swing, the grass was green and very high, and we lived in a perpetual state of moisture. At Fort Possel, on the Ubangi, we again took to canoes, while the latter part of our voyage to Brazzaville was made by steamer. From Bangi onwards I had the benefit of the company of M. Bonnel de Mézières and M. Mercuri, the former from the sultanates of the Bahr-el-Ghazal, the latter from the upper Ubangi and the country of Senussi.

We everywhere met with the most cordial reception, and from Brazzaville had an easy journey by rail to Matadi, where I took ship for France, happy in the thought that my work was now accomplished.

EXPLORATION OF ANTARCTIC LANDS.*

By HENRYK ARCTOWSKI.

ON Friday, January 14, 1898, the *Belgica* left St. John harbour in the morning, and obtained a sounding near the shore giving a depth of 162 fathoms; a second sounding later in the day gave a depth of 855 fathoms. Next day we lost sight of Staten island, and obtained a sounding of 2209 fathoms. This was our first discovery—an unknown depression lying close to the extremity of the Andes, the steep slope of the mountains being evidently continued under the sea. The prolongation of the great mountain chain is to be looked for to the east of Staten island, which forms the last fragment of the Andes; but in that case, what can we make of the Diego Ramirez islands south-west of Cape Horn? The latitude at which we had found the deep sounding was within a few minutes of that of the Cape, the exact position being $55^{\circ} 51' \text{ S.}$ and $63^{\circ} 19' \text{ W.}$ One is led to speculate as to whether the chain of the Andes does not open out like a fan, as so many other mountain chains do.†

On January 19, Commandant de Gerlache pointed out the ice-blink in the south. The sky was uniformly covered with a thin layer of stratus, and just at the horizon a white line appeared like a longitudinal slit, detaching itself by its brightness from the grey of the sky. It was discontinuous, a little undulated, not rising more than from 10' to 25' above the horizon. At 8 p.m. Lecoinge reported the first iceberg, which appeared like a dome rising sharply out of the sea at a distance of about 10 miles. The soundings had given depths of 2105, 2078, and

* Personal narrative of the twenty landings on the lands discovered by the Belgian Antarctic Expedition.

† Arctowski, "The Bathymetrical Conditions of the Antarctic Regions" (*Geogr. Jour.*, July, 1899); and Arctowski, "Observations sur l'intérêt que présente l'exploration géologique des terres australes" (*Bull. Soc. Géol. de France*, 1895, p. 589).

that morning 2018 fathoms; the depth was thus diminishing towards the south.

On the 20th we sounded in $62^{\circ} 3' S.$ with a depth of 1586 fathoms, and at 4 p.m. land was sighted on the horizon, and the depth in $62^{\circ} 11' S.$ was found to be 1028 fathoms. Thus the bed of the ocean was rising fairly steeply when near shore. At 6 p.m. we were able to make out high mountains, the summits standing out black against the sky, and the

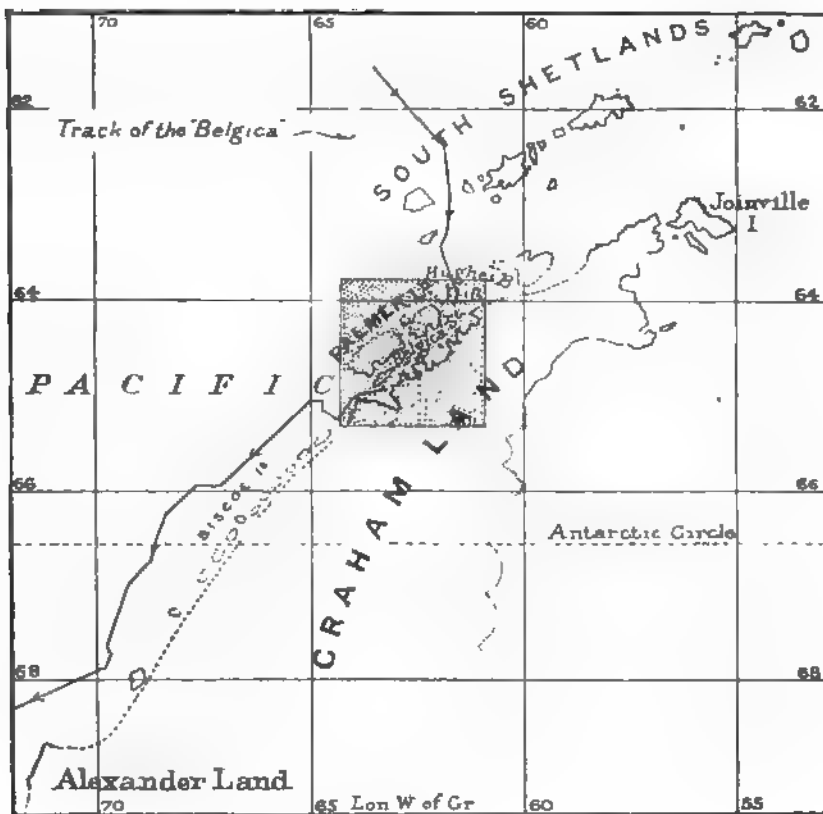


FIG. 1.—PART OF THE TRACK OF THE BELGICA.

gentler slopes covered with snow; these were the South Shetlands, discovered by Dirk Gerritz in 1599, and re-discovered by William Smith in 1819. At 9 p.m. the profile of the land was so clearly visible that by means of a field-glass I was able to make a sketch of Livingstone island. Smith island, which was visible to the right of Livingstone island, plunged almost perpendicularly to the sea; it appeared to be a rounded mass cut here and there into cliffs. We had to pass between these two islands. A large iceberg appeared in the south-south-east, and others

lay off the islands ; at eleven o'clock we passed some pieces of floating ice, and saw more towards the south, and then a little fog, accompanied by fine rain, shut out the view.

On Friday, January 21, while we were at breakfast, a little after eight o'clock, we felt a sudden shock, which seemed to lift the ship twice ; rushing on deck, we found that a thick fog made it impossible to see any distance, but on the starboard side there was a large mass of ice, here and there vague forms of icebergs loomed up ahead, and quite close to us we saw the rock on which the ship was fast. The fog lifting a little, let us see that we were surrounded by rocks. Some of the large blocks of ice were aground, others afloat. On deck no one spoke ; nothing was to be heard, although the weather was calm, but the roar of the breakers on the rocks and the cracking of the ice. The engine went astern, and after a few moments we were afloat again. Splinters of wood torn from the keel rose to the surface, and helped us to realize the gravity of the danger we had escaped.

The splendid spectacle of the icebergs, however, made us forget all else. One of these was like a tower cut out of a great block of sugar ; another, a mountainous island, with a bay in which the billows broke in foam ; yet these were mere fragments of icebergs, broken and of fantastic outline.

At eleven o'clock more ice appeared, and also more rocks, which gave an anxious time to Lecointe, who was on watch. The fog lifted about noon, and for a few minutes we could see a low land covered with great fields of snow, which terminated in the sea as perpendicular cliffs of ice ; this was probably Snow island. Other land could be seen further to the east, with summits bare of snow. Several large bare rocks rose abruptly in front.

On Saturday, January 22, the number of the ship's company was unhappily reduced to eighteen, poor Wiencke being carried overboard by a wave and drowned. It was terrible to be quite near a man who was fighting with death, and yet to be unable to help him. All our efforts were in vain ; twice he was almost saved, but Fate willed otherwise.

Bad weather commenced at night ; all day the wind had been blowing in heavy squalls, and the sea was rough. The fog continued, and in the afternoon snow began to fall. Since morning icebergs had always been in sight, looming up vaguely through the fog, or appearing in all their splendour during the short clear intervals. Many of them were tabular ; complicated forms were less common, for they had come from no great distance, doubtless originating in the land which was in sight. The ship had at length to be laid-to, and, the gale increasing still further, it was necessary to seek the shelter of an island, which no doubt was Low island. At 6 p.m. the weather cleared, and allowed us to see the island, which is extensive and surrounded by large bare rocks, but

itself completely covered with a thick mantle of ice and snow, which hides all irregularities under a uniform surface, and descends to the sea in perpendicular cliffs of ice. Bird-life was very abundant in the "rookeries" which we saw round the island, full of penguins, and lending a strong odour of guano to the breeze. We resumed our way, and the island dropped out of sight.

On Sunday, January 23, the sky cleared at last, the clouds parted, the sun shone, and our radius of vision gradually extended. We were to the west of Low island, which we could now see much more clearly. It seemed to be low and entirely surrounded by huge rocks and abrupt islands quite free from snow. The air was poisoned by the smell of guano. M. de Gerlache changed the course to east-south-east, in order to enter Hughes gulf, and we passed again some icebergs seen on the previous night. One of these was particularly fine and characteristic, with a height of 130 feet and a length of 250 yards. I made two drawings of this berg from different sides. These represent it as a plateau bordered by cliffs and topped by a mound. On one side one could see that the summit was composed of thin layers of snow, perfectly parallel and horizontal. The colour of the ice at the base was a very pale greenish blue, but the blue was intense in a large hollow—a veritable azure grotto. Position at noon, $63^{\circ} 28' 30''$ S., long. $62^{\circ} 13'$ W.

On leaving the island the floating ice was gradually left behind, the weather again became squally with fog and rain, and about 3 p.m. more ice appeared again; generally in a tabular form, but sometimes as isolated peaks or as tables dipping to one side, in which case the lines of stratification remained parallel to the surface of the berg. The weather gradually cleared, and land was sighted, at first a series of islands and rocks, and then a more extensive coast. At 7 p.m. we passed close to a headland, which very probably was Cape Cockburn, but as we went on the charts became valueless; what we saw corresponded to nothing that they represented, and Lecointe proceeded to take bearings at frequent intervals, which allowed him to construct an approximate chart. At 10 p.m. land seemed to block further advance towards the south; high mountains appeared on the horizon, and islets and rocks were scattered over the great bay at whose entrance we had arrived. Many places were clear of snow, and numerous peaks projected above the ice-sheet, so that it would be possible to study the geology. At 10.30 we were close to an island, and de Gerlache, Racovitza, Cook, and I got into a boat and made our first landing in the antarctic regions (see Fig. 2, I.). A considerable part of the island was uncovered. The upper part was like a lava-flow of prismatic structure; lower down the rock was completely cracked, and seems to decompose in large superimposed blocks with straight surfaces. It is an eruptive rock of great density, very hard and brittle, and rings on a blow with the hammer. It is not basalt, but of granitic structure and very fine-grained; its colour is a very deep green,

and I thought that I saw small crystals of hornblende—if so, the rock is a diorite. I had no time to examine the snow, as it grew dark, and we had to return on board.

Monday, January 24, was a day of discoveries, and it is impossible to put down here all that I saw, or even everything which struck me as of special interest. During the night the *Belgica* had to be

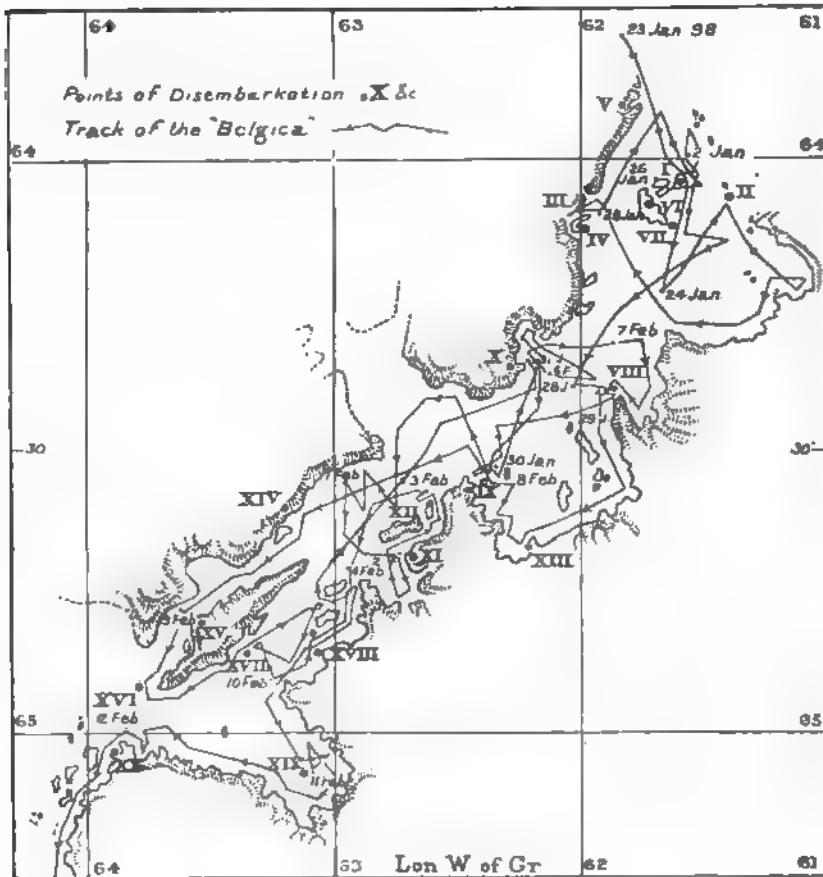


FIG. 2.—PART OF THE TRACK OF THE *BELGICA*, SHOWING LANDINGS.

manœuvred to avoid icebergs, and to prevent being driven on shore by the wind. In the morning it was necessary also to go out of our way a little in order to recognize our bearings of the night before, and to find the ialet on which we had made our first landing. In passing close to an island which was almost free from snow, Racovitza, Danco, Amundsen, and I got a boat out and landed for the second time (II. on map, Fig. 2). It was a small narrow island, no more than 100 feet

high, and appeared to be surrounded by a close colonnade on account of the regular vertical cracks in the rock, which were doubtless produced by extreme cold. The surface was frequently mammilated and worn smooth by the ice. A little sandy clay mixed with guano was found in small pockets between the rocks, and while examining this clay I had the pleasure of discovering the first antarctic insect, almost microscopic in its dimensions.

In the afternoon a breeze sprang up suddenly, and the sky gradually cleared; but the fog descended on us again with equal suddenness, just as it does on mountains above the cloud-level. Every now and again a momentary clearing revealed a beautiful picture of mountain peaks, the bases of which were covered, of great glaciers losing themselves in the clouds, or of fantastic icebergs, everything appearing larger than nature because there was no perspective, and the fine pictures themselves were vaguely framed in cloud. The light, however, was abundant, the low clouds which sometimes touched the sea were white and even brilliant, and sometimes a beam of sunlight threw a sparkling lustre on the ice, or on the great snow-fields, or on the sea.

The silence which brooded over this unknown world was singularly impressive, but occasionally a mountain of ice would collapse with a thundering crash. One could hardly believe one's eyes when these changes in the fairy-like scene occurred, were it not for the dull rumbling growl of the disrupted glaciers. In fact, this realm of eternal ice is so different from anything one had seen that it appeared another world altogether; in sober truth, I do not believe that in any fable the human imagination has described what we have seen there.

From the point of view of astronomical observations Leconte has been unfortunate, as the sun had rarely shown itself, and he had only been able to fix the latitude ($64^{\circ} 9'$ at noon). He kept up a continuous survey of the coast as we passed near the shore, and so succeeded in making a chart of Hughes gulf. The only maps which we possessed—and they are all that exist—were the British Admiralty chart, No. 1238, and Friederichsen's map. The general result of the day's work had been the discovery of an elevated land where Friederichsen's map bore the inscription, "No land in sight (Larsen)." Towards the east and south an uninterrupted coast-line stretched as far as the eye could reach, but in the south-west a large strait opened into the gulf, and this it was necessary to explore. The land in the north-west was also divided by a channel, towards which the commandant first directed the ship. The large bay which we had coasted during the afternoon was very free from ice, although as we went further into the bay the number of bergs increased, but still the *Belgica* had no difficulty in approaching close to the shore. At the head of the bay my attention was particularly drawn to the floating ice. Several of the numerous icebergs were of respectable dimensions; their form varied considerably, but

more or less tabular; one of the bergs was pierced, forming a floating triumphant arch. The stratification of the ice was rarely noticed, but in diffused light it is not easy to make out the difference between the alternate layers of blue and white ice; still, in the upper part of the walls the stratification of the *névé* was often seen. The blue colour of the hollows in the ice was more intense as the light was stronger. Each berg was surrounded by a wide horizontal groove formed by the waves at the level of the sea, and one could often see the grooves of former levels, which showed that the position of equilibrium had changed, and one little iceberg to which we were very close showed two such lines which crossed each other. The surface of the ice reflected so much light that Cook was able to take instantaneous photographs of the floating ice down to the moment of sunset, and even a little later; they were rather faint, it is true, but the outlines were quite clear. It was very difficult to judge distances, one piece of snow-covered land lying in front of another appearing to be part of it, and thus it was necessary to follow the coast very closely in order to distinguish islands from peninsulas.

The quantity of snow which has been accumulated in this region is really formidable. The westerly and northerly winds coming from the ocean doubtless bring great falls of snow, and this is always accumulating, mountains of ice being reared on the top of the mountains of rock. So far as I could judge from the ship, the ice was nowhere uncovered, but thick snow seemed to lie on the glaciers down to the very edge of the sea.

The sunset was very fine, and after it, about 9.30 p.m., the clouds were brilliantly coloured, and the south-western horizon became remarkably clear. At ten o'clock the ship was stopped quite close to the shore, at the entrance to the north-western passage, which doubtless led to the ocean. I was anxious to land to collect some geological specimens, but it was necessary to manœuvre the vessel all the time, in order to avoid shoals and floating ice, and, besides, the commandant did not see the use of landing here, so I had to give it up. About midnight, Lecointe, who was on duty, saw something floating which appeared exactly like a fragment of wood. This was a good opportunity for launching a boat, so Racovitza, Tollefsen, and I set out to see what it was, and after having found that it was only a piece of ice filled with pebbles and clay, we naturally rowed ashore and landed in a little bay (III. on map, Fig. 2), where I had the good fortune to come upon a moraine, which I believe was a ground moraine. There was water behind the moraine, and then a cliff of ice, the end of a great glacier which covered the whole slope of the mountain. Although it was growing very dark and the specimens were collected hurriedly, we found more than ten different varieties of rocks, but none of sedimentary formation. The pebbles were as a rule perfectly round and usually large, while there were also many big blocks.

Tuesday, January 25, was fine and calm, the air perfectly transparent, the sky cloudless, and the heat of the sun intense. We landed at 7 a.m., Lecoq and Dobrowolski in order to make astronomical observations, Danco for magnetic work, Racovitza to search for plants and animals, Cook to take photographs, and I to collect geological specimens. Amundsen went with us. We landed on the promontory of an island (IV. on map, Fig. 2), and it was not without difficulty that all the delicate instruments were got ashore on the steep rocks. By dint of hard work and by division of labour, we were ready to go on board again by ten o'clock. Lecoq had been able to fix the position of this fourth landing* exactly, and also that of Two Hummocks island, which lay right opposite.



FIG. 2.—A TABULAR ICEBERG.

While Racovitza was studying the patches of moss and lichens which were found here and there on the rocks, the doctor and I made use of Canadian snow-shoes to visit the higher part of the island, and we found them a great aid in crossing the snowy slopes, which were usually gentle, though there were dangerous crevasses in places. A thick mantle of snow stretched to the crest of the promontory and stopped abruptly, the further side being perpendicular. Great blocks of ice must sometimes fall over this precipice. I ventured to cross a longitudinal crevasse, and found myself upon a somewhat unstable mass of

* Lat. $64^{\circ} 6' 24''$ S., long. $61^{\circ} 58' 30''$ W. of Greenwich.

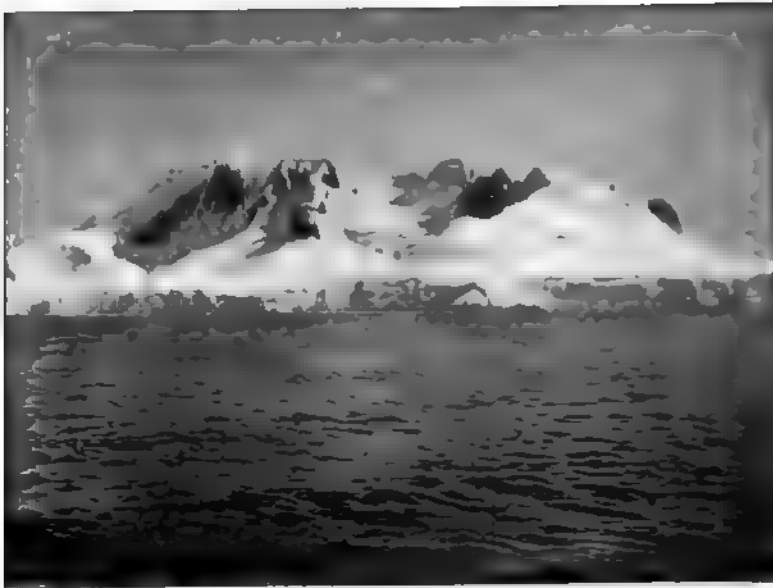


FIG. 4.—GLACIATION OF NORTHERN ISLAND OF PALMER.

ice, poised on the edge of the cliff. A cape which was visible a short distance to the south showed exactly what usually happened. It was too steep for snow to rest upon the seaward slope; but a thick snow-field occupied the top, and numerous vertical furrows marked the places where avalanches had occurred. At the base there was a mass of snow piled against the rocks, its lower portion hardened into ice.

The heat from the sun reflected by the field of snow was so intense that I preferred not to continue the walk with Cook, but sat down in the midst of the silent solitude to allow the grandeur of the magnificent polar landscape to produce its full impression on my mind. To the south and south-east the head of the great bay was formed by a stretch of land extending as far as one could see. It was a region quite alpine in its character, but completely buried by glaciers. The snow-fields rose towards the interior, forming a veritable ice-cap, terminating in a perfectly continuous sky-line. Peaks, mountain ranges, and profound gorges there might be, however they were not to be seen, but lay buried beneath the inland ice. Lower down the relief of the land could be divined beneath its robe of snow, and here and there a bare peak pierced the covering. Nothing like an exposed chain of mountains was to be detected, although near the sea a coast range could be made out, its sides cut by valleys, through which glaciers of various sizes made their way. Along the shore some of the promontories were bare, but on the lower ground the ends of the glaciers were covered by a field

of snow, and were for the most part confluent, forming a platform of ice which gave origin to icebergs. That valleys exist, though they do not show on the surface, is clear from the differences in the size and appearance of the glaciers. The largest are of gentle slope, the smaller steep and broken by numerous crevasses. Some of the glaciers suspended from the cliffs were of extraordinary dimensions. Thus by the appearance of the surface of the ice, and nothing else, one could see that the configuration of the buried land was complicated, and underneath each glacier there must be a great excavated valley, along the bed of which the ice glides downward. The proof of the existence of valleys is very interesting, for it points to a time when there was no ice, but dry land being eroded by the running water of rivers. On the other hand, the thought of these buried valleys brought to my mind the channels of Tierra del Fuego, as they must have appeared in the glacial period, when the end of the Andean chain lay under just such an ice-sheet.

At 11 a.m. we were once more on board the *Belgica*, steering north-east in order to follow and survey the south-east coast of Palmer Land. At 2 p.m. we were opposite a cape where the coast-line changed its direction, and here we made our fifth landing at the head of a little bay where the pebbly boulder-strewn beach sloped so gently that we had to wade ashore, and pull the boat out of the water for safety (V. on map, Fig. 2). The rocks of the beach were erratics from a moraine, and consisted mainly of a grey hornblende granite, but other granites also occurred, especially one with orthoclase. There were also numerous ancient eruptive rocks, some fine boulders of gneiss, as well as quartzites, porphyries, and a metamorphic schist. It was a fascinating problem to consider how so great a variety of rocks came together here. They did not seem to have been carried by floating ice, and two hypotheses suggested themselves: Either the rocks were brought by the glacier which entered the head of the bay, or they dated back to a time when the glacial conditions were very different from those now prevailing. The

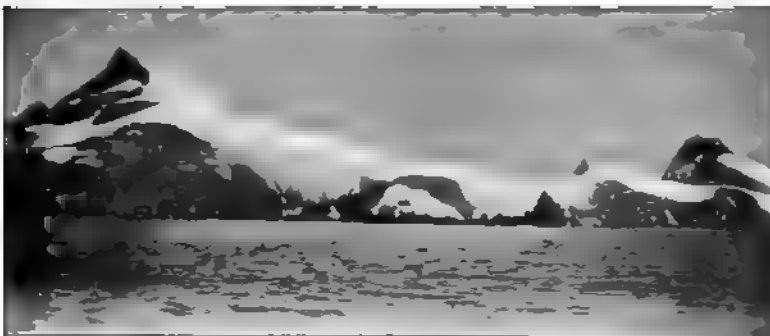


FIG. 5.—THE MOUNT NEAR FIFTH LANDING.

former hypothesis seemed improbable, for the stones were worn, as if they had come from far; although this argument is not a very strong one, since the waves had made their action felt also. On the other hand, the relief of the land was opposed to the formation of an important glacier at this place. The mountains which border the island along which we had been sailing are very near the shore, very steep, sometimes even perpendicular, and their crests are often completely free from ice. Only the lowest part of the flanks of the mountain are covered with suspended glaciers separated from the snow-fields above, and terminating either on the beach or beyond it in the water. Hence the ice which enters the bay cannot come from any great distance, and the material which it carries must be that of which the mountain is composed. Again, the variety of rocks in this moraine is too great to be derived from the neighbouring mountains; they unquestionably come from different places extending over a wide region. Hence, if these rocks are not to be found in Palmer Land, they must come from a southern continent, and have been deposited here as the lateral moraine of a vast glacier which must have filled up the whole of Hughes gulf; and in any case there is evidence of a former great extension of glaciers, that is to say, of a glacial period. Lecointe made an astronomical observation.*

At 4 p.m. we were under way again, steering S. by E. towards the island where we had first landed. The sky was somewhat overcast, at first by flame-shaped cirrus, then by alto-cumulus, the cirrus becoming transformed into cirro-stratus, and finally before sunset a low haze formed on the sea, grew thicker for a while, but shortly after sunset it cleared once more, and we saw the islands and mountains in the south quite distinctly.

Wednesday, January 26, was entirely spent between Two Hummocks island, the island of our first landing, and two groups of islets situated further north. In the afternoon Lecointe, Danco, and Racovitza landed on the island of our first landing in order to make magnetic and astronomical observations, while Cook, Amundsen, and I landed on Two Hummocks island (VI. on map, Fig. 2). Taken as a whole, this island presents a very characteristic form; it is narrow and entirely covered with a thick mantle of snow, which gives it a convex appearance. Two pyramidal mountains project like nunataks, contrasting with the general smooth outline; these two hummocks are ranged in the direction of the length of the island. We landed on the north coast in the hope of being able to climb one of the mountains, and found that the shore was formed by a cliff of ice with only a few promontories of bare rock. I did not see the ice actually immersed in the water at any point; a very narrow strip of bare rock always separated it from the sea. Where we landed the shore was bordered by *roches moutonnées*,

* Lat. 63° 57' 4" S., long. 61° 47' 34" W.

either awash or rarely rising so much as a yard or two above the surface. A little snow rested even on these rocks, and the sea-leopards were sleeping upon them very tranquilly. Along the coast there are deep crevasses in the ice, so that the cliffs have all the appearance of an icefall. The rock of the island is a grey granite, with thick and very regular veins of a dark and compact green rock, and also smaller red veins. There were some erratics also, but these might very well have been carried by floating ice. In attempting to ascend the island, we were stopped in a fog, when at a height of about 350 feet, by crevasses which we could hardly see, although on returning we were able to make out snow-bridges by which we could have crossed some at least. The crevasses lay parallel to the shore—that is to say, at right angles to the slope. We did not see ice exposed at any place, although in the crevasses there was a fine blue colour, but that this was not necessarily due to ice is shown by the fact that on making a hole about 5 feet deep by driving an alpenstock into the snow, one could see in it a patch of intense blue. The snow was soft, not compact, but agglutinated, although of too small a grain to be called *névé*. As the boat was some time in returning for us, we had to pass several hours on a little patch of rock shut in by white cliffs of ice on either side, which we could not even approach in safety. The clay and sand lying in the hollows contained no trace of animal or vegetable life; there was nothing but bare polished rock, a few pebbles, and in the water some seaweeds and a very few molluscs. The fog cleared in the evening; the boat came at last and took us on board. We continued to survey the islands as we passed, in order to complete the chart of the north of the bay.

On January 27 we landed at 10 a.m. on a little islet not far from Two Hummocks, where there was no snow-covering, though its highest point was 100 feet at least. The islet (VII. on map, Fig. 2) was scored by numerous cracks which cut the rock into lozenge-shaped pieces and covered the surface with angular fragments, the whole resembling the lofty crests of the granitic masses of the Alps. The only snow to be seen remained in the dark recesses of the cracks. The island was a rookery of penguins and cormorants, and in places some guano mixed with clay and birds' feathers was found.

Towards the afternoon the *Belgica* steered south-westerly, and in the evening we entered the large strait stretching towards the south, which turned out to be very wide, and in parts we saw high mountains and great glaciers enclosing the headlands, and in one case at least extending beyond the coast into the sea.

On Friday, January 28, the weather was foggy, and we made a sounding in the centre of the channel, finding a depth of 342 fathoms. We were surrounded by whales (*Balænoptera*), whose blowing could be heard constantly, a mysterious sound to break in upon our solitude as we floated between the grey sky and the dark surface of the sea, on

which they played without paying the least attention to our presence. We approached the coast in order to attempt a landing. Amongst several islets and rocks there was one which presented an appearance of stratification with a slight dip; it was flat and almost completely bare, showing that the snow-line here does not descend to sea-level. We could not see the mountains, for only the lowest part of the coast appeared beneath the clouds. A very large moraine, almost completely bare, was seen running along the shore in a north-east and south-west direction. There was a good deal of floating ice. We saw several places where there were great cliffs of ice with curved indentations, doubtless marking the places where icebergs had broken off; the crevasses on Two Hummocks island represented complete fractures, which only required a slight impulse to launch the detached berg.

At dinner there was a great discussion between Lecointe and de Gerlache as to whether these were islands or a continuous coast—a question of great difficulty, for what with the fog and the uniform white glare without shadow or perspective, it was quite impossible to make out the detail of the land. For geographical purposes an approximate sketch-map is not to be tolerated; it is little use to advance far into an unknown region if all that can be inscribed on the map of the Earth is the track of a ship. Such a result, no doubt, is highly creditable to a navigator, but a scientific expedition ought to have other aims. Lecointe was certainly right to insist that the work which had been commenced must be carried through.

At 2 p.m. we landed on the island one mile from shore, which showed an appearance of stratification (VIII. on map, Fig. 2). It was difficult to get ashore on account of the sea, but when we succeeded we found that the whole surface was a smoothly glaciated rock of eruptive origin, traversed by veins 20 feet thick of a grey compact substance. A little snow remained on the island, but the fog prevented us from continuing our survey, and the wind and sea were rising, so we had to return on board.

On Saturday, January 29, the weather was calm again; the fog had cleared away and revealed a marvellous scene. On every side the thick white covering descended to the sea, and only the steepest slopes were free from snow; perpendicular cliffs and steep hill sides were characteristic of all these coasts. A cliff which bordered a submerged valley where an immense glacier debouched showed an appearance of vertical stratification, but our ninth landing enabled us to prove that this appearance was due merely to cracks in the rock, as in all previous cases. This may possibly be an effect of extreme cold, for the *roches moutonnées*, which are preserved from abrupt changes of temperature by snow covering them most of the year, do not exhibit such cracks, or only to a slight extent. It was a curious landscape in white, grey, and black, yet with plenty of light, although the sun was hidden, and a

wonderful play of shadow. Photographs can say nothing as to the complex tints, while painting often exaggerates them; only an exceptionally good colourist could record the delicacy of the tones. My Russian friend Pokhitonow would make an admirable picture of this landscape, so imposing by its severity. The sea was very dark, slightly greenish in the foreground; the horizon loaded with black and grey stratified clouds, and in the whiteness of the stratus above there was a yellowish tinge. The snow was very white, and the glaciers of a white just faintly bluish towards the base, and in the cracks and below there was the blue of the water; the rock was black, in places touched with brown, and lines of yellowish grey; the clouds, merely elevated fogs, encroached upon the summits of the mountains, gradually thickening upwards.

In the afternoon, while waiting for the sun and a wider view, we landed on a floating cake of ice in order to obtain a supply of fresh water.

At 5 o'clock we landed for the ninth time at the foot of a perpendicular rock, elsewhere a high cliff of stratified snow passing gradually into ice in its lower part, made landing impossible (IX. on map, Fig. 2). The crevasses, which form parallel to the shore, cut this wall of ice into sections. The head of the little bay which we had entered was occupied by the front of a large glacier, which terminated in a *mer de glace*; and here we were happy enough to be present at the formation of a very little iceberg—a great block of ice which tumbled into the water with much noise, raising a cloud of dust from the ice, and starting a series of waves across the bay not large enough to hurt our boat. This glacier rises slowly towards the south, and its mountainous border runs north and south. A very characteristic island resembling Two Hummocks lay in front of us. In the evening, as we were still in the same neighbourhood, I made a drawing to show some large curved crevasses which were very sharply marked, and proved that the ice flowed most readily in a direction at right angles to them. Except for two mountain peaks, the island is completely buried under a thick layer of ice, which is undoubtedly a glacier, and, though differing in appearance from valley glaciers or suspended glaciers, is nevertheless subject to the same laws (Fig. 6).

The night was fine, and the *Belgica* remained in the same position in order to get her bearings next day. The sea extended to a distance towards the south and east of the prominent headland, where our ninth landing was made; there was evidently a great bay, and possibly a passage, but the way seemed to be closed by lofty mountains with majestic peaks. Towards the north-east was the channel which we had undoubtedly entered in too great a hurry, and we had to return on our track in order to make a connection with the land previously discovered. There was also a passage in the north-west, but my attention

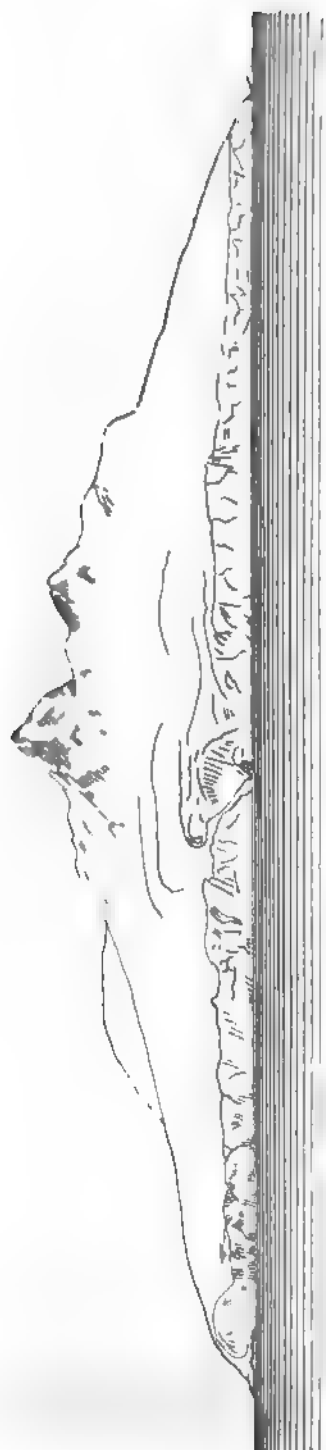


FIG. 6.—TWO HUMMOCKS ISLAND.

was particularly attracted by the fine mountain summits of the large island which lay to the north of our position. While pacing the deck with Lecointe, I pointed out to him a place where I thought a landing might be made, and we discussed the possibility of an attempt to climb the mountains. In the distance a gentle and very regular slope could be seen stretching up to one of the peaks, attaining an elevation of about 7000 feet, and it seemed quite possible to ascend in this way and from the summit to sketch the outlines of the land very easily, and obtain a general idea of its configuration. Lecointe was prepared to adopt Admiral Mouchet's method of surveying by utilizing the height as a base, and fixing the distance of points on the coast by measuring the angle with the vertical. Cook was ready to accompany us, and Amundsen did not wish to be left behind.

On Sunday, January 30, we steered north-north-east, in order to land at the foot of the mountains of our ambition. The commandant decided to accompany the land-party, but in that case the *Belgica* would be left without officers, to which Racovitza objected. Lecointe consequently had to remain on board, and Danco, who was to come with us, undertook the theodolite work; but the preparations which had to be made were too elaborate, and the projected excursion was doomed to failure before it started. In order to succeed, it would be necessary to carry supplies on our backs and make a great and sustained effort, being prepared, if the route was bad, to return and choose a better way, for at present we could no longer see the gentle slope which had been visible from a distance, and it was by no means certain that the point at which we were to land would turn out a favourable one. We took with us two sledges of Nansen's pattern, sleeping-bags, a silk shelter tent, a little

aluminium stove, such as was used by Jackson, Norwegian *ski*, Canadian snow-shoes, ice-axes, a 40-foot rope of raw silk, provisions for a fortnight, even changes of underclothing, and all the instruments after that. Certainly there was far too much baggage, and we were not likely to go so far during the eight days we intended to pass in the glacier; still, there was no knowing whether we should not find something interesting to observe. We landed on a little promontory at the head of a fine bay, where a large glacier entered the sea and the snow lay down to the water's edge (X. on map, Fig. 2). There was no difficulty in getting ashore, but the sledges were horribly heavy. Lecointe, Tollefsen, and Johansen helped us to make a start, and then we continued by ourselves, a party of five, de Gerlache, Danco, Amundsen, Cook, and I. The *Belgica* left the bay to continue her surveys in the south, and to return for us later. At a height between 400 and 600 feet we had to cross several crevasses, which were narrow and spanned by snow-bridges solid enough to allow our loads to pass without difficulty. Higher up a great snow-field stretched before us, whence we could look down upon the glacier which cascaded towards the bay. The ice from this dislocated glacier could only break off in small pieces, so that we recognized that the essential condition for the formation of icebergs is a slope gradual enough to prevent the formation of a *mer de glace* at the extremity. The night passed comfortably, though we were too tightly packed in our tent. After breakfasting on the everlasting oatmeal, we set out with our loads, but it was too foggy to allow of much progress being made. While waiting for the fog to lift we pitched camp for the second time, and no sooner had we done so than the weather became fine.

Cook and I set out for a reconnaissance upon the glacier, which formed a continuous plateau rising gradually towards the interior of the island, where two mountain summits rose above the snow. The conditions appeared to be most favourable towards the north-west, and the whole party set out with the sledges in that direction, and we encountered only a few small crevasses, which were easily crossed, then the slope began to increase. At 2.30 p.m., during lunch, I placed the black-bulb thermometers on the snow, and, although the sun was slightly veiled, they showed readings of $102^{\circ}\cdot6$ and 86° Fahr., although the temperature of the air, measured by a sling thermometer, was only $34^{\circ}\cdot2$. The strength of the solar radiation made us all feel very warm. We enjoyed a very extensive view towards the south, and saw the high mountains on the opposite side of the strait diminishing gradually in height towards the east; the direction of the chain seemed to be north-east and south-west. The whole of this mountainous region seems to have subsided, but if the west of these lands has sunk, it may be that there is a large plain of upraised land to the east, the low relief of which would cause the glaciers to be prolonged into the sea, and in such conditions icebergs formed upon the continental shelf itself might attain a

great size. Here, on the contrary, most of the coastal glaciers are of a different type, terminating at the level of the sea. At 7 p.m. we were still mounting upwards, the weather being remarkably fine, and the view of Graham Land grew finer and finer. The relief of that land, although excessively varied, is singularly softened by the glaciers and the accumulated snow, so that it is only because the valleys hollowed by the running water of some epoch are so deep that some crests and very abrupt slopes remain bare. At the height of 1600 feet we were stopped by a crevasse over 30 feet wide, which we could not cross, and other crevasses appeared beyond it, the whole glacier having a terraced structure. We had consequently to descend again to the ice-plain in order to camp for the night. During the whole of Tuesday we were dragging our loads uselessly towards a hill in the west, but in that direction also we were stopped by numerous crevasses, and in any case, if we had reached the hill we should only have been able to see a part of the horizon. Again we had to retrace our steps to the ice-plain to pass the night, and there we left our camp for the two following days, seeing that it was impossible to reach any high summit. We climbed two nunataks in the east, one of which was easily ascended, and on it Danco and de Gerlache made observations with the theodolite. The minimum temperature of the night between Tuesday and Wednesday was $25^{\circ}5$ Fahr., and between Thursday and Friday $24^{\circ}6$ Fahr.

The radiation from the sun during the three days had not sufficed to change the snow into *névé*. On Friday I went over the whole of the plain, and found snow at the surface everywhere, but at a depth of 4 inches there was frozen *névé*. The plain, upon which we camped, is the result of the complete filling of the valley; for it is certainly a valley which descends from these heights, but it is very difficult to give the orography of the lower parts, as the glacier and the accumulation of the eternal snow hid the form of the land. The formation of the ice, however, showed me that the nunataks are the summits of the sides of the valley, and the cascade that we vainly tried to cross is the step which would have led us to another plain of ice, covering a second terrace of the same valley. Amundsen and Cook tried to pass the crevasses by climbing along the walls of rock which bordered that section of the glacier in places, but they were unable to reach their goal.

From the summit of the more distant nunatak Cook and I had a good view of the *mer de glace* in which a large glacier terminated at the head of the bay where we landed; although the broken fragments could not give rise to icebergs as they entered the water, it seemed quite possible that in winter, when the bay is frozen enough, ice might accumulate to form one or more bergs. In any case, it appeared certain to me that the bottom of this great valley extended below the level of the sea; and I was also led to believe, judging from the distances which separated the nunataks and the angle of slope of the walls, that the same holds

good for the valley in which we were camped. We found some lichens and mosses on the nunataks.

On Saturday night we heard the *Belgica* return, and on the morning of Sunday, February 5, we heard her whistle again. We could not go on board, however, because the wind was blowing too strong, and Amundsen, who went to look out, saw the ship leaving the bay. We changed our camp, and as the wind was always tearing the tent, we were obliged to protect it by a wall of snow.

On Sunday afternoon we all got on board the *Belgica*, and found that Lecointe and Racovitza had made two landings in our absence. We steered towards the east, in order to continue our survey of the coast of Graham Land. The air-temperature was high all day, with a maximum of 45° Fahr. At night it rained, at times very heavily, and it must have produced a great effect upon the snow-fields, because we noticed in descending the plateau that the snow had considerably changed its appearance, and we sank deeply in the porous mass. The rain must have produced a much greater effect than a day of strong sunshine.

On Monday, February 7, the sky was overcast, but the weather was clear and the sea calm, and we passed quickly along the southern coast close inshore. The coast was very remarkable, on account of its great indentations. Hughes gulf was followed by a bay, which we had rapidly sailed round, and then came another still larger, of which we followed the shore; but further south Lecointe found yet another bay, in which very large glaciers terminated. We passed so close to the shore that we could not see the high mountains in the interior of the country, but only the ends of the glaciers coming from the inland ice. On the other hand, we could study in detail the innumerable glaciers which are attached to the flanks of the mountains bordering the strait. The rocks are very steep, and in many places exposed to view, but too often in inaccessible positions. We succeeded, however, in landing at the base of a granitic cliff, near which, upon a little promontory, I discovered a metamorphic schist in contact with the granite (XIII. on map, Fig. 2). The direction of the strata was north-west and south-east, and their dip towards the north was about 45°; a very friable schist alternated with a dark quartzite, and dark green strata of a highly metamorphosed rock. The granite is below, i.e. in the south, and forms a mountain, close against which is a mountain of dark rock, quite inaccessible except for one cliff, at the base of which I was able to risk myself. The stratification seemed much straighter above than at sea-level. From midday the weather was bad, with rain, snow, and fog, but at night it grew finer.

On Thursday morning I went up in the crow's-nest in order to photograph with my binocular camera the three-quarters of the horizon from north to west. It was splendid weather, and here one was absolutely alone, with nothing and no one to distract the attention.

Even from the mast-head it was impossible to see far into the interior of the land; only the first wall of the mountains was visible. The region in which we now were seemed to be much less buried in ice than the land at the head of Hughes gulf, and the glaciers appeared to be local, coming from no distance in the interior. It is also noteworthy that here the peaks rising as nunataks and the walls of rock bordering the glaciers are sharp, and only rounded by ice-action for the 500 feet nearest the sea. In the neighbourhood of a great glacier coming from the south, where the twelfth landing was made by Racovitz and Lecointe, there was a very large *roche moutonnée* in front of the end of the

glacier, which is evidently retreating. A little further to the north of that point I saw a nunatak, at the base of which the ice seemed also to be retreating. On the northern side a very characteristic curvature (α , Fig. 7), with a smoothed surface, was remarked near the snow, while there were large vertical grooves above. I saw very few examples of this kind; as a rule the nunataks were well buried.



FIG 7.—NUNATAK, AT THE BASE OF WHICH THE ICE WAS RETREATING.

The tenth landing (X. on map, Fig. 2) was on a large island. I saw the channel which separates it in the south-west from another land, and to the north-west the sea horizon was unbroken—it was the Pacific ocean. I saw this confirmation of my theories* with much

pleasure; there was no doubt that we were on the west coast of the continental land symmetrically placed with regard to the Southern Andes. There is no passage to the east, and the Biscoe islands form a parallel chain belonging to the mountain system of Graham Land.

We continued to approach the north-west coast, our course being west-south-west. I noticed a wall forming a little cirque between two promontories, at the foot of which a broad glacier terminated abruptly along the shore and stretched upwards towards the mountains in a gentle slope. A series of curved lines, more or less parallel, could be distinctly seen upon this wall; the last of them followed the outline of the field of *névé*. There were ledges of the rock ranged like steps; the

* *Bull. Soc. Géol. France*, 1895, p. 590.

snow lying on the flat shelves contrasted with the dark colour of the steep slopes and emphasized the structure. The same thing was seen in other places where similar conditions prevailed, and it seemed that these steps were old levels of the snow-field, and their existence proves a former greater extension of the *névé*. While the *névé* remained at one level, the exposed portion of the rock wall crumbled under the influence of atmospheric agencies, while the part covered by snow was protected, hence the cutting of the step.

At noon, Lecointe, Danco, Racovitza, Amundsen, and I landed with the instruments necessary for astronomical and magnetic observations; but, unfortunately, we were too late to observe the meridian altitude, a misfortune the more regrettable because Lecointe had urged

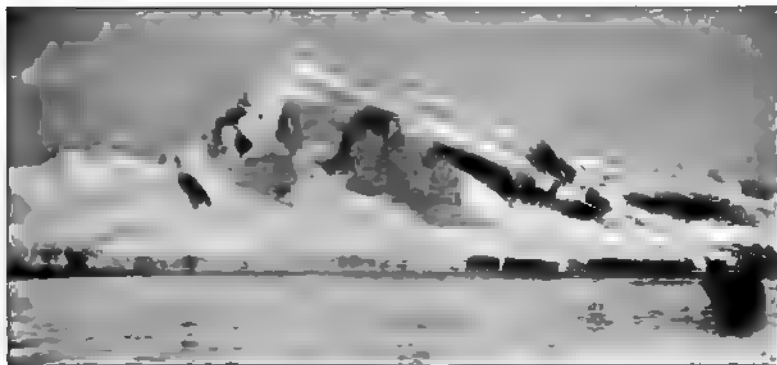


FIG. 8.—MOUNT WILLIAM.

the commandant to allow us to land sooner. We remained some time on the strip of bare rock which was exposed between the field of *névé* and the sea. It was the same black granitoid rock traversed by thick veins and narrow threads of quartz; and there was a great variety of erratic blocks, including specimens of basalt, breccia, several blocks of conglomerate, and some fragments of quartzite. A cave was found in the large-grained porous ice-wall, along the uncovered bed of which a little stream flowed, the first glacier stream I had seen. It came from the direction of a nunatak, and consequently could not have pursued its course to a long distance under the ice; in its bed there were rolled pebbles of eruptive rocks. We were only two hours ashore, so it was impossible to get as far as the nunatak. At our landing-place, and for some distance out from the shore, we saw the bottom of the sea very distinctly, and in some places could even touch it with the cars, it was composed of pebbles and boulders.

At 5 p.m. the *Belgica* resumed her voyage southward, and we entered a channel which narrowed as we proceeded. The mountains on the

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right became lower and their profiles sharper, while on the island to the east of us I saw the snow-fields on the summits merging one into the other, and forming plateaux of ice. A little sierra, composed of five or six peaks in a row, ran in a north-east and south-west direction, and as we were abreast of the first mountain, it presented itself to us as an abrupt wall of rock, the scree at its base partly buried by snow. The other summits further south were much higher. The channel itself had the appearance of a fjord, but there were no mountains at the end, only a low snow-field, and signs of a passage towards the west. As we advanced, the mountain chain on the right became clearer; in the west there was only one high mountain,* and beyond it doubtless the ocean. The sierra on the left showed no trace of stratification. At 7 p.m. we found that the channel curved towards the west almost at right angles, and we entered another channel parallel to the first. There was very little floating ice, and not one iceberg was to be seen. The channel we had entered continued as a great valley into the interior of the island, a glacier descending along its gentle slope from the north. The chain which formed the mass of the island culminated in a high summit entirely snow-covered in the north, and gradually fell off to the south. It would really take years to work out this complex of channels, inlets, and islands, and many facts of general interest would be elicited if the archipelago were to be thoroughly mapped.

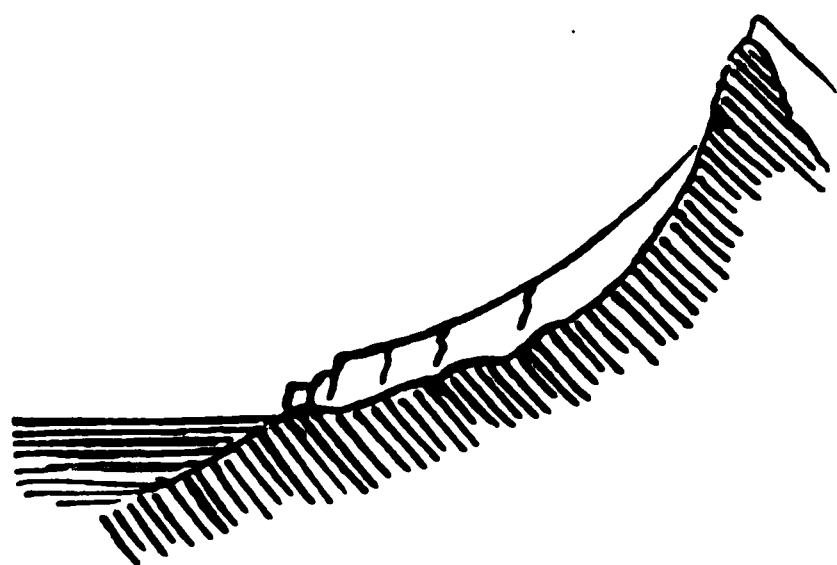


FIG. 9.—SECTION OF SUSPENDED GLACIER.

At eight o'clock we passed some of the flat suspended glaciers characteristic of the island on our left, and a diagrammatic section of one of these is given in Fig. 9. They have always the long crevasses, sometimes slightly curved, with detached berg splinters. The general appearance of these coastal glaciers is a great mass of snow heavily heaped against

the mountain. The surface has a slope far too gentle to produce the effect of a suspended glacier of the Alps, or even of the channels of Tierra del Fuego. The sun set in an orange-tinted horizon, the sky above being intensely blue with little golden clouds, and the mountains facing the sunset flushed pink and changed to red. It would be difficult to imagine any place more beautiful in such perfect weather; the everlasting ice, the grim mountains, and the majestic silence combined to impress the mind with an overmastering sense of the calm severity of nature. Alone in the crow's nest, I rejoiced at my

* Biscoe's Mount William.

good fortune in attaining so great a reward for my voyage as this feast of grandeur and beauty.

On Wednesday, February 9, at 7.30 a.m., we made our fifteenth landing (XV. on map, Fig. 2). The whole coast appeared like one great *roche moutonnée* entirely free from snow, everywhere smoothly polished and scored with sharp grooves, often very deep, running in all directions and crossing each other. The larger were vacant, but others were filled with thin leaves of rock, and some with compact grey veins, giving the rock a schistose appearance. The surface of the granite was strewn with splinters split off by the effects of radiation, usually from one-third to two-thirds of an inch thick, and about a foot in diameter. There were no erratic blocks. The rocks were bare up to a height of about 150 feet, but from this level the snow uniformly covered the island. The sheet of snow gave rise to a trickle of water, forming cascades, under which an abundant vegetation of mosses and algæ had accumulated. A few tufts of moss were found here and there among the stones. The sun shone strongly, and the bare rock grew quite warm. At 8 a.m. on the *Belgica*, when the air-temperature was 41° Fahr., the black-bulb thermometer in the sun read 87°·8, hence the splintering of the surface of the rocks could easily be understood.

At ten o'clock we were on board again, heading south out of the channel, and as we passed along the coast I saw several semi-cylindrical ice-caves from which streams issued, but the tunnels were small compared to the great mass of the ice. At 10.30 we passed the cape at the south end of the mountainous island we had been coasting, and the recording thermometer fell, while the hygrometer rose sharply, as the influence of the ocean made itself felt; and in the distance great icebergs could be seen in the open Pacific. I counted a group of twelve small low islands, mere domes of snow bordering the large island in the south-west; and at eleven o'clock we made the sixteenth landing on one of them (XVI. on map, Fig. 2). Lecoite landed for the noon observation of the sun, making use, as before, of an artificial horizon; Racovitza, Cook, Danco, and I accompanied him. The whole islet was covered with moist snow almost to the water's edge; it was strange to see so great a difference in the height of the snow-line in so short a distance as that separating the XV. and XVI. landings.

These low islets are more exposed to the humid winds from the western ocean, and consequently receive a greater precipitation, the snow not all melting in summer. On the snow we found penguins' feathers, shells carried by the birds, and all sorts of dirt, producing hollows by absorbing heat from the sun, and sometimes these holes were rather deep. The *névé*, which was all oozing with water, was compact at a trifling depth, where it changed into ice. The ice-cap of this islet was crossed by a single narrow crevasse. The rocks round the edge were all iceworn and very flat, in some places scored with cracks, though

to a much less extent than at the place of our previous landing. There were numerous veins of quartz, some quartz in the form of amethyst, and a quantity of copper ore. There were no erratics. All the islets of the neighbourhood had the same appearance, like great whale-backs appearing above the sea. The polished surface extended to just below the surface of the water, and there were also, near the islet where we landed, several glaciated rocks scarcely emergent.

The whole group seems to form a plateau which has been profoundly glaciated, and of which only the higher portions now appear, but this plateau has nothing in common with the continental shelf, the whole of the district which we have explored presenting very clear evidence of a submerged region. From another point of view, these islands are by no means the stumps of mountains worn down by marine erosion; they afford evidence of a great extension of glaciers in some by-gone period. The whole channel, which we were now about to leave, had doubtless at one time been filled by a great glacier which flowed to the Pacific. The cutting off of the summits of these islands may be its work.

At 3 p.m. we turned the southern point of the sierra and steered north-eastward in order to continue our exploration of the main channel, which is divided by low islands into several branches. It is a question of some interest whether it is the Bismarck strait of Dallmann. The sierra reappeared suddenly in the south, on the other side of the entrance to the channel, and continued in a straight line to the south south-west, but a lower parallel ridge appeared west of the main chain, and beyond it a range of islands, the summits of which were still lower, bordered the coast, the whole evidently forming a tectonic chain. Towards the interior a gentle slope of glacier connects the sierra with a higher mass buried under the inland ice. At 4 p.m. we made the seventeenth landing on an islet not far from the east coast of the island we had come round (XVII. on map, Fig. 2). Racovitza, Cook, Danco, and I were left ashore for some hours while the ship continued her route. The end of the island where we landed was a great rookery of penguins and cormorants, and the snow was much soiled for a considerable distance from the shore. The rocks, which are much glaciated, were fairly level, and at the heads of the little bays out of reach of the waves we found numerous pebbles and small erratic blocks of gneiss, various granites, and porphyry, but neither pudding-stones nor basalt; and as I saw no erratics elsewhere, it is probable that these were carried by floating ice. A rocky hill was uncovered to a height of 70 to 100 feet, and above that was the layer of ice, which, in places of more gentle slope, descended to the shore. There was little *névé* on the surface, and all of it melting; water trickled away on every side, though not in any great quantity. The surface of the ice was traversed by vertical cracks, running in different directions, and varying from $\frac{1}{3}$ to 1 inch in width. While the crevasses had vertical sides and were hung with icicles, these

narrow cracks were full of water. This mosaic of cracks occurs on the top of the boss of ice which forms the summit, while on the slopes the crevasses assume a transverse direction, being evidently produced by the tension of the ice as it creeps downwards on every side towards the sea. One main crevasse ran along the whole length of the back of the island. On the side where we landed the ice-covering was pierced by a few scarcely visible points of rock, while the whole southern shore was bordered by a cliff of ice. Another island, similar in every way to the one on which we landed, lay quite near, and on it also



FIG. 10.—ANTARCTIC ISLAND COVERED BY AN ICE-CAP.

streams of water were trickling from the ice. I made a sketch of this island, which is shown in Fig. 10.

From the eastern side the sierra had a much more gentle slope. The cirques in the crest were occupied by very steep glaciers, but lower down the wide snow-fields reduced the slopes to a very gentle gradient. The rocky walls so characteristic of the north-west of the sierra, as seen from the other side of the island, were not represented at all on this. On the northern slopes of Graham Land, on the other side of the wide channel, I saw an immense glacier descending the gentle slopes from the snow-fields which lay about the heights situated in the south-west. It was really a majestic ice-stream filling two large valleys for three-quarters of their depth, while higher up it completely drowned the rocky spur that separated them.

With Cook I walked round our islet, and at its northern end found several fragments of moraines plastered against the slope nearly 80 feet above the level of the sea, and from 15 to 25 feet in height. They contained the same gneiss, granites, and other rocks collected in the little bays of the shore. The predominant rock was granite with hornblende, in fragments which were often angular; the blocks of gneiss were often very large and perfectly polished. Since the granite with orthoclase only occurs in the form of well-rounded pebbles, it doubtless has come from a distance, and the same is true of other rocks. The moraine descends very slightly towards the west, and its direction is that of the channel. This moraine is another decisive proof of the existence of a glacial period in the neighbourhood of Graham Land. In the evening the sky became overcast, the wind rose, and it grew

very cold as we waited for the *Belgica*, which at last returned for us about 9 p.m.

Thursday, February 10, was cloudy and slightly foggy, and for a time we could scarcely see where we were amongst the numerous islands, with the low clouds concealing the characteristic mountain outlines. At noon we made the eighteenth landing, almost opposite the seventeenth, on the other side of the large channel (XVIII. on map, Fig. 2). It was at the base of a pyramidal mountain of red rock, very different in appearance from the surrounding scenery. A great band of red granite seemed to traverse the region from north-north-west to south-south-east. The interesting feature of this landing was the discovery of a moraine at least 70 feet in height, which was set against the mountain-side along part of the beach in the direction of the channel. The rock itself was highly glaciated to just below the level of the water.

The boulders were mainly angular fragments of red granite, and, on the crest of the moraine, numerous blocks of well-polished gneiss. There were also pebbles of hornblende-granite, porphyry, and other rocks, including a white quartzite with small crystals of pyrite, and a very compact black schist. Since we were always in sight of the coast, I never ceased to ask for more landings; I urged Lecoq, de Gerlache, and the others again and again, but not with so much effect as I could wish. The commandant showed himself very obliging; but with a little good-will we could have landed in many other places and collected much more geological material than we did. For this eighteenth landing he conducted me himself, but for ten minutes only. A few strokes of the oars brought us to the beach amid cries of "Hurry up, Arctowski!" I gave a hammer to Tellefsen, with orders to chip here and there down by the shore, while I hurriedly climbed the moraine, picking up specimens as I ran, took the direction with my compass, glanced to the left and right, and hurried down again full speed to get a look at the rock *in situ*; meanwhile Cook had taken a photograph of the place from the ship—and that is the way geological surveys had to be carried out in the antarctic.

At 4 p.m. we passed a fine iceberg, which appeared like the face of a glacier, and must have been recently detached, for it still bore the marks of crevasses. It was about 100 feet high by nearly 700 long.

At 5 p.m. I was again in the crow's nest, and we were heading south-east, perhaps to cut another slice off the northern end of Graham Land. It was not clear, but we could make out enough to recognize landmarks. What seemed to be a channel turned out merely a wide fjord which got slightly narrower towards the head. The amount of floating ice and icebergs increased; some of the latter were over 500 yards, and one was certainly over 1100 yards, in length. Although there was no sunshine, we heard the thunder of the avalanches from the land. In the north-east we saw the front of a very large glacier, but

the upper part was swathed in cloud. At the head of the fjord there were no rocks to be seen; a wall of ice met the water all round—the nature of it, however, was not quite the same at every point.

On Friday morning at 9 o'clock we made the nineteenth landing on a little islet, or rather a big *roche moutonnée* under a great shield of snow, rising gently from the water (XIX. on map, Fig. 2). The strip of bare rock between sea and snow reached only 2 or 3 yards above the level of the water, and was remarkably smooth and glossy. There were two islets of this kind, and between them a moraine just appeared above the sea; it consisted of very large blocks of rock, probably diverse, but I could not get to see them. Lecointe, who landed for an observation on this island, was certainly very hard pressed for time.

The weather cleared a little in the afternoon, and we continued to search for a passage to the east, but there was none—it was merely a fjord. I only caught a glimpse, in a clear moment, of one of the lofty summits which must exist to the east, from which the great glaciers flow. From the head of the fjord valleys radiate inland like fingers from a hand, each filled by a great glacier. Some of the glaciers at the head of this fjord were very large; descending by an easy gradient, they formed a broad flat base, which launched great table-topped bergs of much regularity. In turning to the west after completing our circuit, we met more floating ice. About 6 p.m. we were surrounded by ice, and in fog, which remained at some little height above the water. Here we observed a strange and very beautiful phenomenon. At a given moment the ice suddenly assumed an intense blue colour, of extraordinary purity, a little tinged with purple near the horizon, and becoming lighter higher up, changing into a steely tint above, but showing no trace of green. Fog and ice were coloured alike, hence they must both have been illuminated by blue light. In the south-west, about 15° above the horizon, the blue disappeared and was succeeded by a luminous steel-grey sky, and above this white light a yellowish stratum faded off upwards into a faint orange glow, and finally, beyond 25° above the horizon, the whole sky was a dull grey mass of cloud. The phenomenon was at its maximum intensity about 7 p.m., when the sun was $18^{\circ} 30'$ above the horizon, and at eight o'clock it had become very faint. The air was clear enough to allow us to see floating ice a mile away. Soon after eight the fog closed in again, and when going dead slow the *Belgica* collided with a small berg, but the shock was not severe, although the bow-sprit was damaged.

On Saturday, February 12, a good deal of floating ice was in sight in pieces of all sizes, and there was a little field-ice. The sky cleared and high mountains appeared in the south. At 9 a.m. two rocky points loomed out of the mist, and there seemed to be a passage between them. We followed the coast very closely, and soon found ourselves in a bay, on leaving which we admired a very fine cape which rose in two lofty

needles (Fig. 11). It was the most westerly promontory of this part of Graham Land, for the coast changed its direction here and turned towards the south-south-west. We rounded this point, and left for the time the strait which connects Hughes gulf and the Pacific.



FIG. 11.—ONE OF THE NEEDLES FORMING THE NORTHERN EXTREMITY OF GRAHAM LAND (DISCOVERED BY DISCOE).

At 10 a.m. we made our twentieth landing on the Pacific slope of the Needles, which form the northern cape of Graham Land, to make magnetic and astronomical observations and collect what objects of interest we could find. This landing-place (XX. on map, Fig. 2)

was quite similar to that on the coast west of the sierra. In places the beach was quite free from snow; elsewhere there were little glaciers clinging to the slopes of the mountain and terminating seawards in cliffs of ice. The steep rocky slopes above were absolutely bare up to a height of 700 or 1000 feet, and beyond that rose fields of *névé*. Cook and I climbed a little ridge running at right angles to the range of the Needles. An inclined plain of snow, interrupted here and there in the upper part by transverse crevasses, which were easily crossed, led us to the rocky wall, which there was no difficulty in climbing, thanks to the numerous joints widened by weathering so as to cut up the face of rock into superimposed blocks, and thanks also to the narrow chimneys down which the *débris* of the rock slipped. It is remarkable that these rocks remained quite bare at an elevation far above the snow-line. It is not sufficiently accounted for by the steepness of the slope, though that would make it possible for only a small quantity of snow to accumulate; but the dark walls were so strongly heated by the sun that the snow was actually melted. In making the ascent we found that the low cloud, so characteristic of these regions, was very thin and level on both sides. We passed through the belt of mist between the altitudes of 150 and 300 feet, and above that there was an absolutely clear sky and dazzling sunshine, while at our feet the cloud extended as a smooth grey sea. If such a condition often occurs, it is easy to see how the higher rocks become free of snow in summer, while those near sea-level remain covered. At 3 p.m. the mist cleared completely from the side of the land, and we were able to proceed, passing through a narrow and beautiful sound which separated a group



FIG. 12.—THE NEEDLES, SEEN FROM THE PACIFIC.

of islands from the coast. The mountains rose almost perpendicularly at various points, and on the rocks I again noticed parallel lines following the outline of the tops of the small coast glaciers (*a, a, a* on Fig. 5; *c, c* are crevasses).

The *Belgica* passed on, steering south. It was a pity to leave this most interesting region, where we could so easily collect quantities of valuable scientific material, and of which we could have made a complete geographical study, now that the outlines of the great strait had been charted. We ran close along the coast of Graham Land, noting

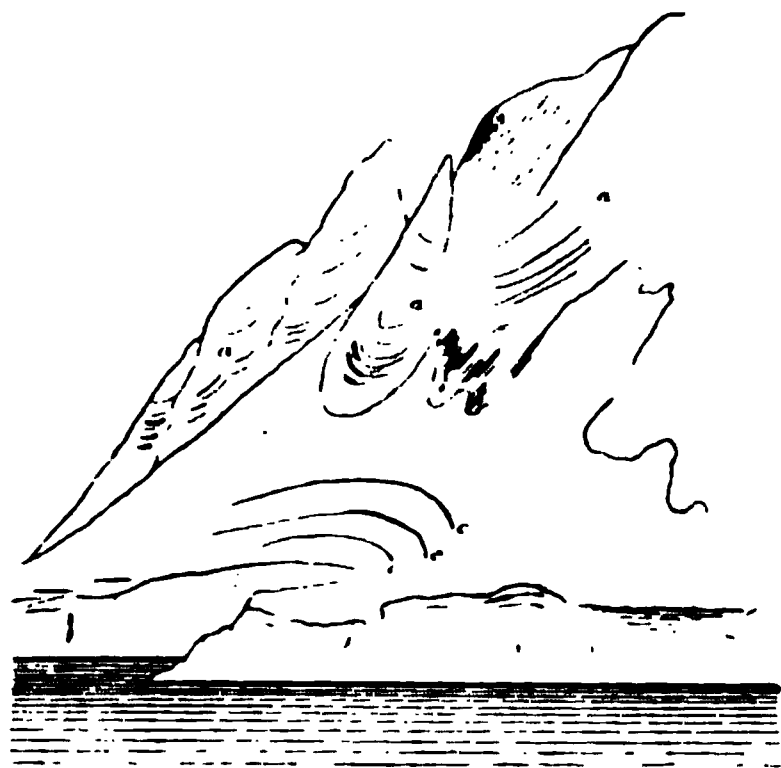


FIG. 13.—MARKS ON ROCKS ABOVE GLACIERS.

that many islets and rocks extended to a considerable distance from the shore. Many icebergs were met, and we also encountered a good deal of sea-ice. At 8 p.m. we passed several typical table-bergs, large, flat-topped, rectangular, the ice stratified horizontally with great regularity, and only a few narrow vertical crevasses to be seen. They rose about 50 feet out of the water; about 40 feet consisted of ice as white as the *névé* which capped it; compact ice was only seen near the base. Just in

the line of the three icebergs of this kind which we saw, we found an enormous flat glacier spreading to the sea without any interruption in the form of an ice-fall.

On Sunday, February 13, the coast was so encumbered with ice that we had to keep out to sea towards the Biscoe islands. About 11 a.m. we traversed a little light pack-ice, and passed near some table-bergs. The melting sea-ice had a dirty yellow colour, and on examining the melted ice under the microscope, Racovitza found it swarming with diatoms. We remained in sight of the coast, and more small islands appeared. At 5 p.m. we sighted a number of fantastic icebergs, amongst which I saw many transitional forms between the table-bergs and the peaked arctic forms. I made drawings of four of them (Fig. 14). The sea was rough, and the breakers dashed against the shore and the icebergs. About 8.30 p.m. we were in the midst of a labyrinth of rocks, and there were also several low snow-covered islands in sight. At 10 p.m. the *Belgica* was in a very uncomfortable situation, threading her way between rocks on every side, on which a heavy sea was breaking: the position was about $65^{\circ} 10' \text{ S.}$, $64^{\circ} 50' \text{ W.}$

On Monday, February 14, the sea was free from ice, except for bergs, many of which were in sight. We steered south-west, in the direction of a strong ice-blink; a less marked ice-blink appeared also

in the east. During the day we designedly sailed over the position assigned to the Biscoe islands in the Admiralty Charts, which seem to have adopted a position so far from Graham Land by making an error of one degree in each co-ordinate; thus Pitt island is shown in $65^{\circ} 20' S.$ and $65^{\circ} 40' W.$, while Biscoe gave its position * as $66^{\circ} 20'$ and $66^{\circ} 38' W.$

On Tuesday, February 15, continuing her south-westerly course, the *Belgica* crossed the antarctic circle. During Wednesday, February 16, we tried to approach Alexander Land, which, however, proved to

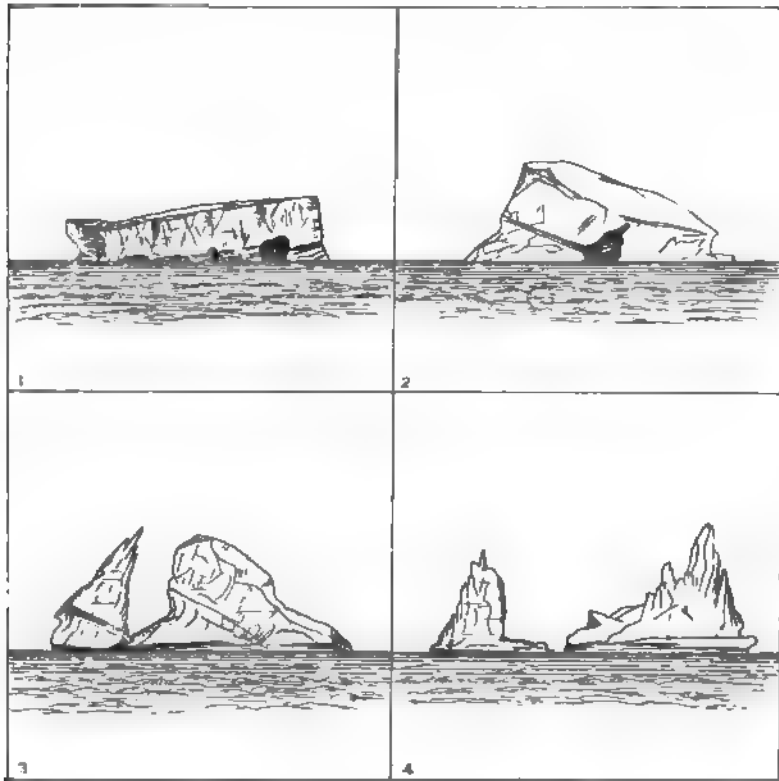


FIG. 14.—ANTARCTIC ICEBERGS, SHOWING TRANSITIONAL FORMS.

be inaccessible on account of the pack. At a distance of at least 20 miles from the land we obtained a sounding of 74 fathoms, with a rocky bottom, doubtless the shoal formed by the destruction of some former island by marine and glacial erosion. In the evening the sky became quite clear, and we were able to see a large island in the east, and the extremity of Alexander Land. The island seemed to

* *Journal Royal Geographical Society*, February 11, 1883. The position as given in Biscoe's MS. log-book is, however, $65^{\circ} 20' S.$ and $66^{\circ} 38' W.$

mark the termination of Graham Land, for the coast beyond it seemed to turn towards the east. It may be, therefore, that there is a strait, or at least a gulf, between the two lands. We could not say positively that we saw the south coast of Graham Land, because the distance was too great. The island formed a mountain chain with many valleys entirely filled with glaciers, but the forms of the mountains were not those of the north. I saw no sharp crests; there were rather great pyramidal masses, their lower slopes having the appearance of terraces, no doubt hills buried in snow. All round the island a great plain of ice sloped outwards, and merged into the surrounding pack. Alexander Land, in the south, was a mountainous aggregate over which very lofty peaks rose majestically; it tended north and south, and was lost to view vaguely on the horizon. A cape was seen in the north of this land, which formed the extremity of an east-and-west chain, though how far it ran to the east we could not see, nor could we be sure that it did not terminate in a great mountainous mass which rose beyond it, and of which the chain might only be a branch. In fact, two or three other lines of mountains seemed to run parallel to each other, unless, indeed, these lines are only those of important valleys; anyhow, there is a great mass of high land in the south-east. Towards the south the mountains seem to become lower and of more gentle outline. It is worthy of notice that here also a plain of ice of gentle slope lies at the base of the mountains, the glaciers merging into it from above, the plain itself merging into the sea-ice studded with imprisoned icebergs. In Alexander Land the glaciers thus fail to reach the sea, for they coalesce together into one great ice-foot, the existence of which fully explains the numerous tabular bergs which we encountered during the last two days. The great difference in the configuration of Alexander Land and the land we had seen further north may very probably be accounted for by the fact that Alexander Land lies outside the region of subsidence. Alexander Land has a wider basis than the Palmer archipelago or the northern part of Graham Land; it possesses a continuous coast-line in place of mountains, plunging perpendicularly into the sea. The continuous coast-line seen from a distance may indeed be broken into bays and capes in detail, but, even if so, all these irregularities are buried under the uniform plain of the ice-foot. But, on the other hand, we do not know what the scenery of the lands discovered by the *Belgica* would be like if they were restored to their aspect of the glacial epoch under a burden of ice as heavy as that which bears upon the remote antarctic solitudes of Alexander Land.*

* There is a very noticeable difference between my description of Alexander Land and that given by Dr. Cook in his work, 'Through the First Antarctic Night.' I cannot discuss the question from memory, and the only thing that I can say is that all my notes were written on the spot from day to day; that I have always made a point of

DR. SVEN HEDIN'S EXPLORATIONS, 1899-1900.

LETTERS lately received at the Society from the Swedish traveller permit us to give a more connected account than has yet appeared in the *Journal* of the important explorations carried out by him during the past eighteen months. Dr. Hedin continues his work with untiring energy, and we may safely say that so rich a harvest of scientific results has rarely fallen to the lot of any traveller. All has been done with characteristic thoroughness, and on the eventual publication of the maps and observations we shall possess a detailed knowledge of the regions traversed, such as is available for few countries beyond the limits of Europe and other of the best-known parts of the world.

Dr. Hedin's survey of the Yarkand-darya, or Tarim, is described in a letter written on February 25, 1900, but, through an oversight, not despatched until some months later. After making up his caravan at Kashgar, the traveller started in September, 1899, making his way direct to Lailik, on the Yarkand river, where he bought one of the large ferry-boats used for the transport of caravans across the stream. This he fitted up with every comfort, laying down a deck on which his tent could be pitched, with a dark cabin for photographic operations. Seated at a table at his tent door, he was able to map every turn of the river, sketching in its features with an amount of detail hardly available for any other river outside Europe. Floating slowly down with the current, the journey took three months, but its end was reached at Yangi-kul * before the closing of navigation by ice. Distances were fixed by the use of a special instrument giving the rapidity of the stream, which was measured many times each day. The volume of the river—which was measured some sixty times in all—was sufficient to float the boat throughout, except at a point where most of the water is diverted to supply the irrigation channels of Maral-bashi. The shallows here were passed with the help of one hundred men, who carried the boat over. At places the river has changed its course, and now flows through absolute desert, but these spots were very picturesque. Its course is exceedingly tortuous, some of the bends actually taking it in a westerly direction. Dr. Hedin made various excursions for the purpose of

giving correct descriptions and noting down exactly my first impressions. Cook says in his book that Alexander Land forms a group of islands, the largest of which is about 18 miles long, and that the mountains of this island attain a height of at least 4500 feet, etc. . . . It is always very agreeable to be able to furnish measurements, but when these measurements are simply based on estimate they do harm. It may be that the length of coast-line visible towards the south was 36 miles, and it is not improbable that the summits of Alexander Land reach a height of 9000 feet, or even more. The fact is that we made no measurements, and that we have little to add to the description as given by Bellingshausen.

* Placed in 87° 27' E. in the Society's map of Tibet and surrounding regions.

visiting important places on either side of the river. His map fills sixty large sheets, while voluminous notes, photographs, etc., were also taken.

At Yangi-kul the explorer was joined by his caravan, which had come by the high-road *via* Aksu and Kurla, and here he formed his winter camp. For himself, however, there was to be no long rest, for in ten days he started with four men and seven camels for Cherchen, striking by a direct line across the desert. This was a difficult and dangerous journey, all supplies, and even fuel, having to be taken with the party. For twenty days nothing but sand was seen, but all went well, only one camel being lost *en route*. From Cherchen Dr. Hedin made an excursion to Andere,* and returned to Yangi-kul by the old river-beds of the Cherchen-darya, and new arms of the Tarim, after an absence of sixty-six days. This was in February, 1900.

Dr. Hedin's next work was in the Lob Nor region, where, as already announced in the *Journal* (vol. xvi. p. 345), very important discoveries were made, which, in the traveller's opinion, fully confirm his former views as to the history of the lake. A note in the December number of *Petermanns Mitteilungen* (p. 297) supplements in some particulars Dr. Hedin's first communication on the subject. Following the southern † foot of the Kuruk-tag and the dried-up bed of the Kumdarya, or "river of the desert" (see map in *Journal*, vol. xi. p. 692), the traveller reached (March 27) the shores of an old lake with extensive salt-deposits, as well as dead trees and sedge (kamish). The floor of the lake, which, in Dr. Hedin's view, can be nothing else than the ancient Lob Nor, consisted of horizontally bedded clay, with vast numbers of snail-shells, *Limnæa*, etc. The ruins discovered in the neighbourhood seemed to be those of a Buddhist temple and Chinese inn. During the march southward ruins of another, larger, settlement were discovered, and soon afterwards an expanse of water was reached, which proved to be the Kara-koshun, or Lob Nor of Prjevalsky. This has lately extended itself in a northerly direction, while shrinking in its southern parts, thus showing a tendency to return, according to Dr. Hedin's theory, to its ancient bed. A new arm of the Tarim, diverging at Shirge-chapgan and flowing east into the lakes first discovered by Dr. Hedin, was also found. Returning once more to Yangi-kul, the traveller sent his caravan south to the mountains, while he himself continued, in his boat, the exploration of the Tarim, and especially of the lakes fed by it to the west, finally reaching Abdal, near the entrance of the river into Prjevalsky's Lob Nor.

Dr. Hedin's latest letter, dated from Temirlik, in the Chimen (Chamen)

* Some 120 miles to the west-south-west of Cherchen, according to the Society's map of Tibet.

† In *Petermanns Mitteilungen* this appears as "northern," which is evidently a mistake. It is given as above in the letter received at the Society.



Tag, October 29, 1900, gives a brief account of a tour made during the summer of last year in Northern Tibet. Fixing his main camp a little south of Lake Gas, in a splendid mountain region called Mandarlik, he went south (July 20) with a caravan of 6 men, 7 camels, 12 horses, 1 mule, and 16 sheep. The route led south-east across the Akka Tag and back to the Chimen Tag by a circuit to the west, the total distance traversed being 965 miles.* As elsewhere, detailed observations of every kind were carried out, the map (from Abdal) being constructed in 194 sheets, and 16 positions fixed astronomically, bringing up the total number so fixed during the journey to 61. According to a letter sent by the explorer to a friend in Copenhagen, the furthest point reached to the south-east was in the neighbourhood of the upper Yang-tse. During eighty-four days not a human being was met with, though an old inscription on a rock proved that Mongols had once lived there. Wild animals, especially antelopes, bears, wild sheep, and goats, were numerous. The journey was concluded on October 20, one man (an Afghan hunter) and many of the animals having died on the way. Great cold was experienced—the thermometer falling on one occasion to -8° Fahr.—and much suffering was caused by storms from the west, always accompanied by snow and hail.

At the time of writing, Dr. Hedin was planning a short journey among the mountains to the west, after which he hoped, while the lakes and rivers were frozen, to complete his work in the district of Kara-koshun and the old lake-bed to the north.

JOURNEYS IN MESOPOTAMIA.—REVIEW.†

By General Sir CHARLES W. WILSON, K.C.B., K.C.M.G.

DR. VON OPPENHEIM has lived much in Moslem countries, has spent several months in the Arab quarter of Cairo studying Arabic, and Moslem customs and habits of thought, and has several times visited Syria and Palestine. The knowledge thus acquired was of great service to him during the journey which he undertook, in the summer of 1893, from Beirút through the Haurán, the Syrian desert, and Mesopotamia to Baghdád and the Persian gulf. It also gives a special interest to much that he has written. Historical notices of important towns, and frequent references to ancient and modern authorities, especially to

* Dr. Hedin says that the way led through completely unknown districts. This of course refers to the actual routes followed, for the region had been previously crossed in certain directions by Carey, Rockhill, Wellby, and Bonvalot.

† 'Vom Mittelmeer zum Persischen Golf.' By Dr. Max Freiherr von Oppenheim. 2 vols. Reimer. Berlin, 1899.

Arab historians and geographers, add much to the value of a pleasantly written record of the journey, which is accompanied by numerous illustrations, most of them good and some excellent. Great care was taken to obtain the correct forms of Arab place- and personal names, and in the text they are given in Arabic, with a transliteration in accordance with rules approved by the German Oriental Society. All names, whether in the text or on the maps, have been edited by two such competent authorities as Dr. Moritz and Dr. Hartmann. A marked feature of the book is the attention paid to the manners and customs of the races and tribes in the various districts passed through, and to their relations with the Imperial and Local Governments. A clear and connected account is published, for the first time, of the constant disturbances in the Haurán, from 1879, when Midhat Pasha made his well-intentioned attempt to introduce a modified form of Home Rule amongst the Druses, to the pacification of the country in 1897 by the vigorous action of Abdullah Pasha. Two chapters of much interest are devoted to the Bedawín, and more especially to the important section of the Shammar tribe which follows Sheikh Fária, who some years ago submitted to the Turkish Government and accepted the rank of Pasha. During the last twenty years the Porte has brought steady pressure to bear on the nomads of Syria and Mesopotamia, by planting Circassian colonies amongst them, by increasing the number of military posts, by establishing a school at Constantinople for the sons and relations of the leading sheikhs, and sometimes by forcible settlement. The results thus far are encouraging. Waste lands are being brought under cultivation, the tribes are more under control, and there is greater security to life and property. The difficulties with which the Government has had to contend are well illustrated by the story of the long struggle of the Circassian colonists at Rás el-'Ain with the Shammar Arabs.

From a geographical point of view the value of Dr. von Oppenheim's book lies in the descriptions of new or rarely travelled routes, in the nomenclature, and beyond all in the valuable map and memoir prepared by Dr. R. Kiepert. Leaving Damascus, the author rode by Bosra and the eastern side of Jebel ed-Drúz to Sáli, and thence across the rock-see of the Harra to Dumeir by a route, partly new, which enabled him to examine the volcanic district of Tulúl es-Safá, the interesting ruins of Kasr el-Abyad in the Ruhbe oasis, and the almost circular crater of Jebel Seis. Evidence of the former existence of a large population was found in the Tulúl es-Safá, and at the foot of Jebel Seis, where are the ruins of a town which it is suggested may have been the Roman station Anatha. From Dumeir to Bír Zobeide, and over the hills to Karietein, on the Damascus—Palmyra road, an untravelled route was followed, and the accurate nomenclature of the hill-country obtained for the first time. Passing through Palmyra, Dr. von Oppenheim reached Deir

ez-Zor, on the Euphrates, a town which, from its situation between the Anezeh and Shammar tribes, has played an important part in the policy of the Porte towards the Arabs.

From Deir a route, for the most part new, was followed up the valleys of the Khábúr and Jaghjagh to Nisibin, and thence to Háúr Zummar on the Tigris, and Mosul. The valley of the Khábúr is now waste. The few trees seen by Layard have disappeared, and it is difficult to find either fuel or camel fodder. From its junction with the Jaghjagh to the Euphrates, the river, even in summer, is full of water and can be forded only in a few places, and it is apparently navigable for small steamers above Sawar. The enormous number of mounds in the valleys of the two rivers, which mark the sites of towns, villages, and forts, and the remains of irrigation canals, attest the former prosperity of the country where, as late as the tenth century, olives and cotton were largely cultivated. An interesting instance of the widespread ruin caused by the passage of Turkish, Mongol, and Tatar nomads is the complete disappearance of the names of places mentioned by the old Arab geographers on the road from Nisibin to Mosul. From the latter place Dr. von Oppenheim rafted down the Tigris to Baghdád, and thence proceeded by river and ocean steamer to Basra, the Persian gulf, Maskat, Karachi, Bombay and Zanzibar. There was little new to describe, but the historical notes, especially those relating to the last thirty years, are valuable, and the narrative is well illustrated from photographs.

The book closes with a paper on the summer flora of Syria and Mesopotamia, which gives the Arab names of the plants collected, and notes by Prof. Dr. P. Ascherson; and a memoir by Dr. R. Kiepert to accompany the map of Syria and Mesopotamia in two sheets, on a scale of 1 : 850,000. The map has a special interest and value. In it Dr. Kiepert has embodied all the information collected by his father during his long, laborious life, and it is a fitting tribute to the memory of that eminent geographer. It is the first attempt to combine all existing material and produce a really detailed map of the two countries. A special feature is the care bestowed upon the nomenclature, and the successful effort, made with the collaboration of Profs. Moritz and Hartmann, to grapple with the diverse forms of place-names given by travellers of different nationality, and often ignorant of Arabic. Much attention has also been paid to the altitudes, which in many places are very uncertain from lack of accurate observations. The memoir, in which the data for the construction of the map are fully discussed, shows the care and thoroughness with which Dr. Kiepert has worked, and his map, well turned out by the firm of Dietrich Reimer, will probably long hold its place as the best of the country it represents.

Dr. Sachau's little book * is a record of a preliminary journey of

* 'Am Euphrat und Tigris.' By Eduard Sachau. Leipzig, 1900.
No. II.—FEBRUARY, 1901.]

inquiry to Babylonia and Assyria, undertaken in the winter of 1897-98 at the instance of the Commission for the archæological exploration of the Euphrates and Tigris regions. The journey occupied six months, and led to the selection, as the first site for excavation, of el-Kasr (Babylon), where important discoveries have already been made. Dr. Sachau, who travelled extensively in Syria and Mesopotamia in 1879-80, and published the results he obtained in 1883, reached Babylonia on this occasion by way of the Red Sea, Persian Gulf, and Baghdád. After examining Babylon and the numerous ancient sites between the Lower Euphrates and the Tigris, he travelled up the right bank of the latter river to Mosul, and thence, after visiting Nineveh and other sites east of the Tigris, reached the Mediterranean by Deir ez-Zor and Aleppo. The book is charmingly written, concise without being dull, full of information on a variety of subjects, and enlivened by graphic pictures of life amongst the Arabs and other natives. The author, besides being a scholar and archæologist, is a close and keen observer, and his remarks on the geography and topography of the country, the great extension of cultivation since his previous visit, the acquisition of large landed estates by the Sultan, the advantages and disadvantages attending the employment of Kúrd and Arab irregular cavalry, and other matters, are much to the point. The narrative is illustrated by well-selected views from photographs by Dr. Koldewey and Herr Meyer of the Babylon Commission, and is accompanied by five sketch-maps of the route followed.

THE MONTHLY RECORD.

EUROPE.

A Rain-storm in Central England.—The January number of *Symons's Meteorological Magazine*, which will henceforth be edited by Dr. H. R. Mill, contains an interesting account of the heavy rains which fell over Central and South-Western England on December 30 and 31. Great damage was caused by floods in the valleys of the lower Severn and the Warwickshire and Somerset Avons. The great mass of data collected by the British Rainfall Organization has made it possible to publish a general description of the distribution of the heavy falls accompanying this storm within a fortnight of its occurrence. It appears that over 3 inches of rain fell in the twenty-four hours between 9 a.m. on December 30 and 9 a.m. on December 31 along a narrow belt of country stretching from Bristol and Chepstow to Coventry along the nearly straight line formed by the valleys of the lower Severn and the Warwickshire Avon, over a length of 85 miles from south-west to north-east, and a breadth averaging only 12 miles. The area of very heavy rain was limited on the south-east by the steep slopes of the Oolitic escarpment, but it was surrounded by a triangular surface of diminishing rainfall, which had an area of over 7000 square miles with a fall greater than 2 inches in the

twenty-four hours. The south-eastern edge of this belt appears to have corresponded roughly with the line of the Chalk escarpment from Dorsetshire to Berkshire, and then to have run in a more northerly direction nearly to the mouth of the Humber. The northern edge of the rainy area did not seem to have crossed the Trent. While no opinion is given as to the cause of this somewhat remarkable concentration of heavy rain, the fact is mentioned that just before the worst of the rain the wind had changed suddenly from south-west to north-east, in consequence of the passage in a south-easterly direction of a deep atmospheric depression. This suggests the idea—which it might be worth while to test—that the wind blowing along the steep face of the Oolitic cuesta, to use Prof. Davis's term, was unable to escape rapidly by lateral expansion over the surface of the ground, and so was checked sufficiently to allow of a much heavier precipitation in the deepest part of the valley than on the surrounding higher ground. In any case, the coincidence of the axis of such a phenomenon with the main structural lines of England can scarcely be accidental, and the relationship between configuration and meteorological occurrences is an interesting study in physical geography.

The Glaciation of the Inn Valley.—The problem of the terraces of the Inn valley, propounded by Prof. Penck twenty years ago, and to the solution of which he himself, with Blaas and Fritz von Kerner, afterwards contributed not a little, has been once more approached, with a view to its final settlement, by the professor in his latest researches. In brief outline, the results are as follows: The position and form of the Ziller glacier-tongue—important as the lowest member of a continuous stream of ice which in post-glacial times filled the whole floor of the wide Inn valley—was accurately determined. The existence of such a glacier, having its origin in the Zillerthal, had been already assumed as the only possible explanation of an impounding of the ice, to which in turn it was alone permissible to attribute the formation and peculiar form of the Inn valley terrace, as well as the high level to which the Achensee above Jenbach has been dammed back. In other words, the terrace of the Inn valley can only be put down, in view of the arrangement of its materials, as the lateral moraine of a glacier. From the mouth of the Zillerthal to the district above Kufstein, the valley presents all the characters of ground from which a glacier-snout has retreated. Below Jenbach there are found in succession down the valley, first the hollowed-out basin with the typical lake represented by the small but comparatively deep (34·5 feet) Rainthalersee; next a stretch with a drumlin character, from Kundl to Angath; and finally the end-moraines of Kirchbichl. Owing to the absence of striæ, it was necessary to have recourse to the American view of "kames," or shingle-moraines, to explain the genetic character of these surface forms. After the last glaciation of the great ice age—the fourth according to the results of recent investigations—during which the snout of the Inn glacier filled the basin of Rosenheim on the northern skirts of the Alps, the ice retreated to Imst, north-west of the mouth of the Oetzthal, or more than 60 miles above the position of the Kirchbichl snout, and a corresponding distance in the side valleys. These two positions of the snout correspond to the "Wippstadium" and "Innstadium" of Penck. Now, since the three important side valleys of the Oetzthal, Wippthal, and Zillerthal enter the main valley during this interval, a comparatively small advance of 20 miles or so from each of these was sufficient, at the time of the main advance which followed the retreat above mentioned, to fill with ice the whole 60-mile section of the main valley. From his own investigation of the moraines, supplemented by those of Fritz von Kerner, Penck defines three stages of glaciation subsequent to the ice-age. The fourth and last glaciation properly belonging to this, in which the snow-line descended to 4000 feet, was followed by the "Wippstadium" above mentioned, when the snow-level

rose to 6300 feet, and this again by the "Innstadium," which was marked by the most extensive glaciation since the ice-age—that to which the terminal moraines at Kirchbichl belong. The snow-line then descended again to 5000 feet. Next came the "Gschnitzstadium," with a snow-line at 6600 feet, followed by the stage at which the glaciation of the Alps now remains, with a snow-line at 8200 feet on the edge, and 8900 feet in the centre, of the range. The post-glacial epoch, which, apart from a hypothetical advance of the ice supposed by botanists, has been regarded as a single unit, has now, therefore, been shown to consist of a series of stages.

ASIA.

Scientific Results of Dr. Hedin's Journeys.—By the publication, as a supplementary number (131) of *Petermanns Mitteilungen* (forming at the same time a complete volume in itself), of the scientific results of Dr. Hedin's journeys in Central Asia between 1894 and 1897, a mass of detailed information on the geography of the inner regions of the continent has been presented to the world, such as has rarely, if ever, been brought home by a single traveller since the time of Humboldt. Dr. Hedin's geographical genius, and the ardour with which he has thrown himself into the tasks he has undertaken, are well known, but only a perusal of his minute and exhaustive descriptions of the countries visited permits us to realize to the full the untiring zeal and industry brought by him to the execution of his work. It is unnecessary to recall here the broad results of Dr. Hedin's journeys, which are already so well known to geographers, and, amid the mass of material now made available, it would be difficult to select any as specially calling for mention. The bulk of the work is made up by a series of chapters in which the whole itineraries followed through Turkestan, Northern Tibet, and the region of the upper Hwang-ho are presented to the reader, with a detailed commentary on the physical structure of the country, its surface features, and the changes these have undergone, as well as on the natural processes by which such changes have been brought about. The description is illustrated by a large number of sketches, sections, and diagrams, by which an understanding of the various physical phenomena is much facilitated. Among the many interesting points discussed are the formation and structure of the dunes, and of the peculiar conical hills held together by the growth of tamarisks; the movements of underground water, in which connection the remarkable fact is recorded, that in the immediate neighbourhood of the larger streams the well-water is brackish, but in the centre of the desert is perfectly sweet; the growth of vegetation in lagoons and on the margins of streams, and many others. The question of the past history of Lob Nor is of course entered into, while a series of appendices treat of the altitudes, nomenclature, botany, and other special subjects. Special mention must be made of the admirable maps prepared by Dr. B. Hassenstein, which not only give the results of Dr. Hedin's surveys, but combine in a way never before done the whole of our knowledge of the Tarim basin and Northern Tibet. There are five sheets on the scale of 1 : 1,000,000, three showing the Tarim basin and the mountain ranges to the south, the other two the central and eastern sections of the great Kwen-lun system. A particularly valuable feature is the facility given for the correlation of the work of different travellers, which has so often been published without any attempt at combination. Thus the parallel routes of Captain Wellby and Sven Hedin, the relative position of which has never been quite clear, are well brought out. Strangely enough, the journeys were made at an interval of only a month, but the routes, though in places only 20 miles apart, were separated by the high range of the Koko-shili. The results of Captain Wellby's journey are

better shown by Dr. Hassenstein than ever before,* and a connected view is likewise presented of the surveys of MM. de Rhins and Grenard, of which the excellent sectional maps of the latter fail to give a good general view. The importance of a further exploration of the Arka (Akka) Tag, which Dr. Hedin regards as the main range of the Kwen-lun system, and to which he has lately returned, is well brought out by the wide blank which occupies its position on the map, though its extensive snow-fields were seen by the traveller as he skirted it in 1896.

Russia and Manchuria.—The agreement concluded between Russia and China at the close of last year concerns only Feng-tien or Sheng-king (formerly Liao-tung), the southern of the three provinces into which Manchuria has recently been divided under Chinese administration, but this is the most thickly peopled and important, while similar arrangements may be expected to be made before long for the other provinces. According to the terms of the agreement, the civil administration of Feng-tien is allowed to remain in the hands of the Chinese, while the military occupation is maintained by Russian troops, and a Russian political resident with general powers of control will be stationed at Mukden, the capital of the province. The Chinese soldiery is to be disbanded, and all forts and defences not occupied by the Russians to be dismantled, the munitions of war contained in them being handed over to the latter. Law and order will be maintained by local police under the Tartan general Tseng, who will, however, apply for Russian help in case of emergency. Niu-chwang and other places now occupied by Russia will, however, be handed over to the Chinese civil administration when the pacification of the province shall have been deemed complete. The area of the province is estimated at 55,000 square miles, and its population at about 5½ millions, while the two other provinces, Ghirin and Helung-kiang, have an area of about 100,000, and 200,000 square miles respectively, with populations estimated at 6 millions and 1½ millions. By reason of its fertility and natural productions, no less than as affording the future highway between Eastern Siberia and Northern China, Manchuria possesses great importance, and the effects of the recent agreement are likely to be far-reaching. Information on the country is to be found in Mr. H. E. M. James's paper published in the *R.G.S. Proceedings* for September, 1887, as well as in his book, 'The Long White Mountain'; in Captain Younghusband's book, 'The Heart of a Continent'; and in the paper by Mr. Turley published in the *Journal* for September, 1899.

The Salt Lake of Larnaca, Cyprus.—In a paper recently read before the Geological Society, Mr. C. V. Bellamy gave a description of the salt lake of Larnaca, in the island of Cyprus. His investigations were conducted mainly with the object of settling the question as to the origin of the salt in the lake, which is situated about a mile or more to the south-west of the town of Larnaca, and occupies a hollow on the eastern side of an irregularly shaped basin, its deepest part being about 10 feet below mean sea-level. The barrier between the salt lake and the sea is mainly composed of shelly sand overlying a bed of stiff calcareous clay associated with masses of conglomerate. Between the lake and the sea the ground is so salt as to preclude cultivation, but on the other sides the soil is of average fertility. The sea-water appears to percolate through the uppermost deposits, and, meeting with checks in the conglomerates, slowly reaches the basin, where it is evaporated to dryness by the summer heat and deposits its

* An error is, however, made in showing the Chumar river as rising in the lake to the west, unless the fact of the freshness of its waters be considered proof of an outlet. Captain Wellby stated in his book that the Chumar rises in the hills to the east of the lake.

salt. Artificial channels have been made to intercept flood-water and convey it to the sea, so that it does not dilute the brine of the lake. The rainfall in the catchment-area of the lake is shown to be only 223 million gallons, and as the capacity of the lake is 480 million gallons, it is assumed that the balance of 257 million gallons must be derived from the sea. The lake is probably situated on what was an extensive arm of the sea at the close of the Kainozoic Age. The salt-harvest commences in August at the zenith of summer heat, and it is reported that the occurrence of one heavy shower at this time of year suffices to ruin its prospects. The quality of the salt collected in the Larnaca salines is said to be of unusual excellence, and it is suggested that a large and remunerative traffic could be carried on if markets could be opened for the salt. The paper is illustrated by a number of maps.

Dr. Schaffer's Journey in Asia Minor.—Further news of Dr. Schaffer's geological researches in Asia Minor (cf. *Journal*, vol. xvi. p. 556) is given in the December number of *Petermanns Mittheilungen* (p. 297). From Adana the traveller crossed the plain to Cape Karatash, afterwards ascending the Dede-Dagh, and visiting Jebel Missis and other ridges composed of reef-like rocks with vertical strata and a general strike from north to south. He then made his way to Rudrum Kale, crossed the Jihan at Kum Kale, and proceeded to Kushju. This lies west of Mount Duldul, which an attack of fever prevented the traveller from climbing. It has two steep summits, which the natives consider inaccessible. The high water-level in the Jihan necessitated a circuit to the east round Mount Duldul in order to reach Maraul, whence Dr. Schaffer made his way between the Giaur Dagħ and the Kurd Dagħ to Antiochia, and on *viâ* the Beilan pass to Alexandretta. He says that there is a distinct continuation of the Syrian depression in the form of a rift-valley, which in the neighbourhood of Marash is intersected by the lines of dislocation of the Taurus.

AFRICA.

Baron Erlanger's Expedition to Abyssinia.—News has lately been received of the arrival at Addis Abbaba, after a successful journey through the country of the Arussi Gallas, of the Erlanger expedition, which set out in January, 1900, for the purpose of scientific exploration in North-East Africa. The primary object of the expedition was the study of the distribution of animals in this part of Africa, the superintendence of the zoological collections being shared by the leader with Herr Oscar Neumann, known for his former journeys in East Africa. Geographical work was not, however, excluded from the programme, and a cartographer, Herr Johann Holtermüller, was attached to the expedition for this object. Dr. Ellenbeck, the doctor of the expedition, hoped also to secure collections of botanical specimens. The explorers, who started from Zeila on January 12, 1900, reached Harrar early in March, excursions having been made in various directions off the direct route. From Harrar, a south-westerly route through the almost unknown country of the Arussi Gallas was chosen, with a view to striking Dr. Donaldson Smith's route at Skeikh Husein. Details of the journey are not yet to hand, but it is stated that the country traversed was picturesque and fertile, and inhabited in part by agriculturists of Arab race.

Further Explorations in the Siwa Oasis.—We learn from the December number of the *Geographische Zeitschrift* that the exploration of the Siwa oasis, towards which Mr. Silva White and Baron von Grunau have each contributed something within the last few years, has been continued by an expedition under Prof. Steindorff, in which Baron von Grunau again took part. Its primary object was the examination of the remains of temples and tombs which the former

expeditions had shown to exist in such numbers in the oasis of Jupiter Ammon, but attention was paid to other researches also. A start was made in November, 1899, and the Siwa oases reached after a march of nineteen days. The attitude of the Senussi sheikhs to the party was reserved, but not openly hostile, and the antiquarian research yielded rich results. On the return journey rock tombs were discovered in the Araj oasis, pointing to a larger population in former times. Excavations in the Bahrieh oasis also brought to light two Egyptian temples of the sixth century B.C.

The Uganda Protectorate.—The preliminary report by her Majesty's special commissioner on the Uganda Protectorate is of value, as giving the general conclusions as to the prospects and capabilities of that country by one of such wide experience in tropical Africa as Sir Harry Johnston. The maps by which it is accompanied are likewise useful as attempts to show, in a graphic form, some of the chief factors to be taken into account in the problem of the future of Uganda. In the first, the protectorate is divided up into zones of altitude, this being, in Sir H. Johnston's opinion, the determinant factor as regards the healthiness or unhealthiness of the separate districts. The large areas above 5500 feet are almost entirely free from malarial fever, and are said to be as healthy for Europeans as the best parts of North and South Africa, although even here health must depend on the use of dwellings with sound roofs, and windows that can shut out the cold winds. Between 5500 and 3500 feet the country is only moderately, but below 3500 feet must be regarded as very, unhealthy. This is especially the case along the banks of the Nile (except at the station of Wadelai), the coasts of Lake Albert, the district of Lake Baringo, and in a less degree the shores of Lake Victoria. Much of the present ill health might, however, be got rid of by draining the swamps and clearing away the rank vegetation which shelters mosquitoes, as also by the building of better houses. The second map shows the rainfall, which, in the districts north, east, and west of Lake Victoria, is estimated at 40 to 60 inches annually, decreasing towards the north and north-east, until on the southern half of Lake Rudolf it is probably less than 10. The wettest districts of all are those round the slopes of Ruwenzori and Elgon, but the Mau plateau has also a large rainfall. In the greater part of the country a dry season scarcely exists, though the greatest rain follows the equinoxes. The population map shows the most densely peopled areas to lie round Mount Elgon, and along the western and northern shores of the Victoria Lake, where the number to the square mile is put down as from sixty to one hundred, and in certain small districts above one hundred. Among the Bantu-speaking peoples, Sir H. Johnston considers that an extraordinary improvement—mainly due to missionary work—has taken place since the barbarous days of Mtesa and Mwanga. The naked Nilotic negroes, on the contrary, give no encouragement to missionary work. The question of the products and resources of the protectorate is fully entered into. About two-thirds of the area has a singularly fertile soil, but the useless life led by the natives—fostered by the abundance of the banana—has caused this natural wealth to remain undeveloped. Wheat, oats, and barley, thrive on the uplands and drier districts to the north, and almost any other grain in the lowlands. Rice has been until lately almost neglected, but the numerous swampy valleys are admirably suited for its cultivation. With railway and steam transport, no other part of tropical Africa could compete with Uganda as a coffee-growing country, while parts are singularly suited for the cultivation of cacao and tea, for the latter of which a native demand may be expected. Sugar has already been manufactured for local use. Other important resources are rubber and timber, while with suitable regulation the ivory supply might be made a permanent asset. Little can be said as to the existence of

minerals, but in addition to iron, copper, gold, and coal have been reported. In discussing the present position, Sir H. Johnston attributes much of the civilized aspect of Uganda to the enlightened ideas of the native chiefs. As an instance of the progress of education, he mentions that several of the chiefs use typewriters. He regrets that the Baganda have not been taught English by the missionaries, Ki-Swahili being not nearly so useful as a *lingua franca* here as in other parts of East Africa.

Prof. Fischer's New Expedition to Morocco.—It is announced in *Petermanns Mitteilungen* that Prof. Theobald Fischer, of Marburg, whose researches during 1899 on the physical geography of the country along the northern foot of the Atlas were referred to in the *Journal* for that year (xiii. p. 660, xiv. p. 209), has undertaken a third journey to Morocco, during which he will devote his attention to the "black earth" region which extends from Mogador in the south to Larash in the north.

AMERICA.

Explorations in Labrador.—A recent number of *Science* (1900, November 2) records the results of soundings carried out last summer by the schooner *Brave* on the Labrador coast. These have shown that the deepest of the fjords, so characteristic of that coast, is not Hamilton inlet (54° N.), as has been previously supposed, but that greater depths occur in Nachvak bay in 59° N. This fjord, which extends some 25 miles into the land, with a U-shaped section and precipitous walls, is cut off from the open sea by a rocky sill, immediately within which the water has a depth of 107 fathoms, while 6 miles to the west it reaches 110. Two other sills divide the deep water of the fjord into several basins. The bottom temperature (at 110 fathoms) was 29° Fahr. in August. Explorations in the interior were carried out last summer (according to a note in the December number of the *Geographische Zeitschrift*) by a party from Harvard University,* which spent three months in these northern regions. The country explored was everywhere mountainous, and three high summits, named respectively Mount Eliot, Mount Faunce, and Mount Elizabeth, were discovered. Gold and other valuable minerals were also found.

Travels in Mexico and Guatemala.†—Those who undertake to go over the beaten paths in countries so long known to the civilized world as those of Central America, do so, not in search of the new, but rather in the hope of revealing the old. Such, we are expressly told, was the main object of the distinguished Berlin archæologist, Prof. Eduard Seler, who, in 1887–88 and 1895–97, paid two long visits to these lands in the interest of archæology and ethnography. On both occasions he was accompanied by his wife, Frau Cæcilie Seler, who, however, confines herself in this volume to an account of the second and more important journey. No pretension is made to scientific treatment, and the contents are modestly declared to be nothing but a reproduction of the writer's experiences and impressions. But it will be found that some of these experiences are of exceptional interest, while the impressions acquire permanent geographic value from reproductions of an almost unique series of photographs, mostly taken, often under trying conditions, by the gifted lady herself. In some respects Frau Seler's work

* Presumably the same by which the above-mentioned soundings were carried out, as the note in *Science* is communicated by one of its members, Dr. R. A. Daly.

† 'Auf alten Wegen in Mexico und Guatemala. Reiseerinnerungen und Eindrücke aus den Jahren 1895–97.' Von Cæcilie Seler. *Map and Illustrations*. Berlin, 1900.

forms a close parallel with the sumptuous volume issued in 1899 by Mr. and Mrs. Maudslay, who, in Chiapas, Guatemala, and Honduras, had traversed much the same ground a little in advance of the German travellers. On reaching Quirigua, by way of Puebla, Oaxaca, and the Tehuantepec peninsula, in January, 1897, Dr. Seler found that some of the elaborately sculptured monoliths, which had been cleared for the impressions taken in 1894 by Mr. Maudslay, had in that short interval become again so thickly moss-grown that it was difficult to distinguish their outlines. In the presence of these stupendous blocks, the travellers were almost awestruck, wondering how such monuments, with their fanciful and intricate ornamentation, could have been erected by a people like the Mayas, who had no knowledge of iron. On visiting the monuments near the Honduras frontier, they again found that the clearings made in the forest by former travellers had been once more overgrown with dense bush. "For hours," writes Frau Seler, "we crept along in this tangled wilderness, wearily hewing a way with the woodman's knife. Luckily, my husband had brought Maudslay's plan, which enabled us to find the more important objects, . . . though a general view of the site is unfortunately prevented by the too luxuriant vegetation." In her preface, Frau Seler remarks that, so far as she is aware, nobody since the days of Thomas Gage, over two centuries ago, has given a consecutive account of the country along the historic highway from Oaxaca by Chiapas to Guatemala. Now the student will find this region not only graphically described, but admirably illustrated from the writer's negatives. The account of an expedition to the rugged uplands of Mixteca Alta (Mixtlan, "Cloudland," of the Aztecs), which may be said to have been re-discovered by our travellers, abounds in details of exceptional interest to the geographer, the naturalist, and the antiquary. New and old were here intermingled in delightful confusion. Stately Spanish churches, themselves in ruins through earthquakes and neglect, were found standing on the foundations of ancient Zapotec and Mixtec temples. The women, who could speak only the strange tongues of pre-Columbian times, were seen crouching in the very attitudes depicted in the Aztec picture-writings. Wheat, barley, and oats of recent introduction were found flourishing side by side with the native flora. The whole ground was strewn with relics of antiquity, while the exquisitely painted clay vases, resembling those of Cholula, discovered in old graves, gave a striking confirmation of Förstermann's view that the so-called "Toltec" builders of Cholula, Teotihuacan, etc., were not Nahuas or Aztecs, but Mayas, who at an unknown epoch migrated from the Anahuac plateau to Guatemala and Yucatan, leaving memorials of their presence in Mixteca Alta, Tehuantepec, Chiapas, and other districts. It should be mentioned that, besides antiquities and ethnography, much attention was everywhere paid to the local flora. But the rich botanical collections, not being yet completely classified, are reserved for publication elsewhere. The want of an index will be sorely felt by students, but some compensation will be found in the excellent large-scale map, which is a noble specimen of German cartographic art.

British Guiana Frontier Delimitation.—We have received from Lieut. Herbert Street, of the 20th Hussars, who, at the invitation of Captain Rolleston of H.M.S. *Surprise*, lately accompanied the boundary delimitation party to Point Playa, the starting-point of the new frontier on the coast, an account of the proceedings for the determination of the position of the point, and its marking by a permanent beacon. The Venezuelan Commissioners having failed to appear, the *Surprise*, with the British Commissioners, Captain A. W. Baker and Mr. M. McTurk, on board, sailed from Georgetown on October 5, 1900, arriving off the mouth of the Waini river the following day. The position of Point Playa was a matter of uncertainty, as the strip of coast in which it lies is rarely visited, being

quite uninhabited, and forming a vast mangrove swamp with occasional mud flats and small shingly beaches. The surf is dangerous at times, and on this account a surf-boat manned by an Indian crew had been brought. By means of the ship's cutter, a landing was effected at the mouth of the Waini, where was a very small shingle beach which had formerly stretched a mile out to sea. It had lately been visited by Indian fishermen. The search for the point proving ineffectual, it was resolved to proceed by the Mora passage, 7 miles long, connecting the Waini with the Barima, to Morawhanna, a small settlement visited once a week by a steamer from Georgetown. A Portuguese fisherman who lived here was the only man known to have visited Port Playa, and with his help, though still with some difficulty, the required spot was discovered. Its position was fixed astronomically as in lat. $8^{\circ} 33' 25''$ N., long. $59^{\circ} 59' 45''$ W., which differs materially from that hitherto shown. After a return to Georgetown, a second visit was paid to the spot for the purpose of erecting a beacon, much difficulty being again experienced from the violence of the surf. The beacon has a base of concrete 4 feet square sunk 3 feet into the ground, surmounted by blocks of $3\frac{1}{2}$ and $2\frac{1}{2}$ feet respectively, at the top being a pole with board stating the position as fixed, the names of the commissioners, and the date (October 9, 1900).

British Guiana.—Among other matters dealt with in the 'Reports for 1897-98 and 1898-99,' on British Guiana, the following may be noted. There are indications that the people of the colony are directing their attention to the cultivation of minor products and to industries other than sugar. Rice is being largely grown, and tobacco has been successfully cultivated. Between the true coast lands and the ranges of sand-dunes which occur in Berbice, Demerara, and Essequibo, there are large tracts of alluvial soil which appear to be suitable for the cultivation of various products. Gold-mining operations have been carried on during the years under notice, and the probable future prospects of this industry are said to be distinctly favourable. Geological surveys were made of the Potaro, Conawaruk, Omai, Demerara, and part of the Essequibo rivers, and the knowledge acquired points to the gold-bearing regions of these rivers being much more extensive than was formerly believed. Many facilities are offered by the new Crown Lands Regulations which came into force on May 1, 1898. It is thought that the natural wealth of the Crown forests must in time attract outside capital. Woods of great beauty and variety abound, suitable for various purposes; as also gums of recognized commercial value. The population of the colony on December 31, 1898, was estimated at 286,222, showing a decrease of 262 as compared with the preceding year. The mean temperature throughout the year 1898-99 was about 82° Fahr., the mean maximum being 88° in the month of September, and the mean minimum 74° in the month of January. There are two lines of railway in the colony—from Georgetown to Mahaica (county of Demerara): length open for traffic 20 miles; and from the Demerara river to the Essequibo river, $18\frac{1}{2}$ miles, metre gauge. The total length of roads open for traffic is given as 264 miles. There are three canals on the Demerara river, two on the left and one on the right bank, each 4 miles long and 60 feet wide, and running at right angles to the river.

Geography of the Rio Tapajos, Brazil.—In 1896 and 1897, journeys on the Tapajos for the purpose of geological research were undertaken by Dr. F. Katzer, who gives in *Globus* (vol. 78, No. 18) some interesting notes on that imperfectly known river and the settlements on its banks. The use of the river for steam navigation is confined to the lower section, below the first cataract—that known as Maranhãozinho—the construction of roads at the portions broken by rapids being indispensable for the proper utilization of the Tapajos as a line of

communication with the interior states of Brazil. The last settlement served by the regular steamers is Lauritania, on Ananaz island, 17 miles above Itaituba. This, though containing only 281 inhabitants, is the chief centre of a widely extended "município," which reaches the southern limits of the province of Para at the Salto Augusto. With the recent development of the rubber industry, new settlements have sprung up, while others that still figure on our maps have passed out of existence. Such is the old Munduruku settlement of Uxituba, founded by P. Egydio de Garezio, in 1848, as also those of Sipotuba and Bacabal. The settlements near the Tapajos mouth—Altar do Chao, Boim, and Aveiro—all show signs of decline, and though the last-named is still the largest village on the Tapajos proper, its place will soon be taken by Itaituba, where the construction of a steamer pier, public hall, and a fine church has already been taken in hand. Its commercial importance as the centre of a rich rubber district is already greater than that of Santarem. Three rubber-plantations—a great rarity on the Amazon—have been started here. Dr. Katzer gives details as to the breadth of the lower Tapajos at various points. At Bella Vista, near the falls, it is only 200 yards wide; at Itaituba, 3480 yards; to about which breadth it again narrows at Aveiro, though generally far wider between Itaituba and its mouth. The bottom of the river is extraordinarily uneven, in consequence of the unequal resistance offered by the geological formations which compose it. Reefs, with associated sandbanks, are formed by hard conglomerates, and often cause the greatest hindrances to navigation, many spots being impassable at low water. Narrow channels, with depths of from 50 to 70 feet, remain open, however, at many of these points. Between the lowest falls and Altar do Chao the greatest depth found was 77 feet (a little above Itaituba). The difference between high and low water level amounts to from 16 to 20 feet on the lower river, where the dry season lasts from July to December. Remarkable anomalies in the levels observed sometimes occur. Thus, while the highest level at Cury was in 1897 about 8·7 inches below that of the year before, at Itaituba it was registered as 0·66 inch higher than in 1896. The rate of flow varies immensely at different parts. Opposite Santarem it was found to be, on an average, 1·15 foot per second, but no current at all could be discerned between Altar do Chão and Boim. From sectional measurements of the bed of the river, Dr. Katzer found the volume at Santarem to be 438,900 cubic feet per second, but at Itaituba only 97,380. Although the measurements were not made simultaneously, Dr. Katzer thinks the difference cannot be wholly due to this, but that at Santarem the volume is swelled by water entering from the Amazon by Villafranca.

Austrian Explorations in Brazil.—In April next a scientific expedition is to be despatched by the Vienna Academy of Sciences to the states of São Paulo and Parana, in Southern Brazil, with the primary object of researches on the flora of the Serra do Mar and the Serra do Paranapiacaba—a district at present almost a *terra incognita* from this point of view. Geographical work will not, however, be left out of sight, while attention will be paid to meteorology and climatology, and to the collection of zoological and geological, as well as botanical specimens. The expedition will be abundantly equipped with all the necessary appliances. Its leader will be Dr. Richard von Wettstein, professor of botany and director of the botanical gardens in Vienna, and his staff will include Prof. V. Schiffner, of Prague, as second botanist; Dr. Fritz von Kerner, of the Vienna Geological Institute, as meteorologist, geographer, and artist, besides having medical charge of the party; and August Wiemann, of the Vienna Botanical Garden, as gardener. It is probable that representatives of other branches of science, as well as of the Brazilian State Survey, will also join the expedition, which will not return till

November, though at present no definite limit has been fixed to its duration. It is regarded as the first of a series of expeditions to be sent out by the Vienna Academy to the portion of Brazil above alluded to, for its all-round scientific study from the modern point of view. Others which may be sent in succeeding years will therefore take up different branches of science as their special object of research. In laying down this programme, the Academy is taking a course quite in keeping with old Austrian traditions. In the eighteenth century Brazil yielded to the zeal of Jacquin, who in after-years did much to give direction to the early training of Simony, the rich horticultural treasures which have made the reputation of the park at Schönbrunn. Early in the nineteenth century valuable contributions to our knowledge of Brazil were supplied by the Austrian naturalists Mikan, Pohl, Natterer, Schott, Tschudi, Lhotsky, Wawra, and others; while that most valuable monument of scientific research, the 'Flora Braziliensis,' first saw the light in 1829 under the auspices of the Austrian imperial house. The resumption of Austrian interest in Brazil, at the opening of the twentieth century, meets with the cordial support and approval both of the Central Brazilian Government and those of the states concerned.

AUSTRALASIA AND OCEANIC ISLANDS.

The Australian Commonwealth.—The scheme of federation, which has so long engaged the attention of the Australian Colonies, and to which effect was finally given by the Act passed by the British Parliament in July, 1900, took practical shape on January 1, 1901, when the new Commonwealth was formally inaugurated at Sydney by the swearing in of Lord Hopetown as first Governor-General. The colonies which have joined in the movement and together form the Commonwealth of Australia are those of the Australian continent, together with Tasmania, New Zealand having no doubt wisely decided against participation in view of the great expanse of ocean by which she is situated from the rest. West Australia, which at first held aloof, has since joined as an original State. The site of the Federal capital has not yet been decided on, but it will in any case be a town, other than the present capital, within the colony of New South Wales, a name mentioned in this connection being that of Orange, situated some 25 miles north-west of Bathurst. The following table shows the area and population of the separate colonies, and their trade and financial position as given in the Statesman's Year Book for 1900 :—

	Area, sq. miles.	Popu- lation.	Debt.	Revenue.	Expen- diture.	Total imports.	Total exports.
New South Wales ...	310,700	1,357,050	63,761,666	9,751,185	9,754,417	24,453,560	27,648,117
Queensland ...	668,497	498,523	33,598,414	4,174,086	4,024,170	6,007,266	10,856,127
South Australia ...	903,690	362,897	24,431,590	2,665,477	2,632,840	6,184,605	6,795,774
Tasmania ...	26,385	146,667†	8,412,904	908,223	830,169	1,650,018	1,803,369
Victoria ...	87,884	1,176,854	48,354,277	6,887,463	6,692,444	16,768,184	15,872,246
Western Australia ...	975,920	168,480	10,448,363	2,604,943	2,980,495	5,241,965	4,960,066

It is to be hoped that a new era of prosperity awaits the colonies in their federated state, and that the new conditions will also be beneficial to the Empire at large.

Mitigation of Floods in the Brisbane River.—In a paper on this subject, contained in a recent issue of the *Queensland Geographical Journal*, the Hon.

* Including the northern territory.

† In 1891.

A. C. Gregory mainly deals with the scheme recommended by Colonel Pennycuick, whose name is connected with important works of this nature in India. His scheme, we learn, "is to form a regulating reservoir in the upper Brisbane valley, in which a sufficient quantity of water can be stored during the high floods to reduce the river 15 feet at the Victoria bridge, and thus restricting the flood level to 15 feet above mean tide, and this would reduce the surface gradient of the river one-half below the bridge." "For this purpose he proposes to construct a regulating reservoir, having a capacity of twenty-five thousand million cubic feet, in which to store the surplus rainfall until the excessive rain ceases." Colonel Pennycuick bases his computations on the records of the rainfall during the flood of February 5, 1893, and considers that the flow of water in the channel of the river would be limited to four-fifths of the rainfall, the remaining fifth being absorbed by the soil and vegetation within the catchment area. He is also of opinion that the river-channel, which is below tide-level, is of little use for the transmission of flood-water, and therefore dredging the river below the city will not afford relief from flood. By applying the data to the heavy rainfall and floods of 1893, the author endeavours to show that a regulating reservoir of such a capacity as that proposed by Colonel Pennycuick would be quite inadequate to retain the surplus waters of abnormal floods like that of 1893. He is of opinion that Colonel Pennycuick's scheme is a feasible one, but points out that the reservoir ought to have at least five times the capacity of that specified for the storage of the excessive rainfall. The system is one which would apparently entail a greater cost than the colony could afford to expend on a work which would only benefit a single district. A tabulated series of observations of rainfall during the flood of February, 1893, is given, the paper closing with a discussion on the subject.

Geology of the Bismarck Archipelago.—A short sketch of the geology of the Bismarck archipelago, given from personal observation by Dr. G. Thilenius, in *Globus* (vol. 78, No. 13), is of interest in view of the extremely scanty knowledge hitherto possessed respecting the geological structure of the islands. The rocks of the archipelago are almost entirely either coral or of eruptive origin. The eastern section, to the east of the main islands, consists without exception of atolls, the separate islets of which are merely heaps of *débris*, so that the natives lack all articles of stone, with the exception of axe-heads made of stones obtained from the roots of driftwood. The western section, into the structure of which Dr. Thilenius enters with greater detail, displays both coral and eruptive rock. In the Tauai (Admiralty) group, which is the most important of this section, the principal rock is obsidian, which forms steep cones, but Dr. Thilenius found beneath this specimens of a micro-granite, while two kinds of ore (one a Pyrolusite) also occur. The group shows signs of great fluctuations in level. The Agomes group, west of Tauai—a typical coral group, according to Darwin's theory—has in its centre islets formed by an old basalt eruption, which must originally have covered all the space enclosed within the present outer reef. The Ninigo group, shown on the maps as surrounded by one continuous reef, is in reality quite different, as many passages exist, including a wide and deep one dividing the group into two separate sections. As regards the central group of the archipelago, Dr. Thilenius considers that the central chain of New Britain is the continuation of the primitive rocks of the centre of New Guinea. The island seems originally to have been connected with the latter, ending eastward in the Baining range of the Gazelle peninsula, where the old coral reefs can still be seen; the rest of the peninsula being of more recent date. New Ireland must be regarded as an old fringing reef, once forming the eastern edge of a land now sunk beneath the sea, and which may have formed one mass with New Guinea and New Britain. The

writer points out the importance of the discovery of the micro-granite, with the associated Pyrolusite, on Taui, especially in its bearing on the possible existence of sedimentary formations on the northern, as on the southern, side of the primitive axis of the islands.

Expedition to Kerguelen Land.—We learn from the *Mouvement Géographique* that Captain de Gerlache, late commander of the Belgian Expedition to the antarctic, has undertaken a new voyage to Kerguelen Land on behalf of a French colonization company, the object of which is to attempt the acclimatization of sheep on the island. The expedition consists of a steam-yacht and a sailing ship, the latter of which will transport 1500 sheep, as well as some shepherds, from the Falkland islands to Kerguelen, the climate of the two being in many ways similar. The party will include two French zoologists, MM. Ronnier and Pérez, who will study the natural history of the island, where meteorological observations will also be made.

POLAR REGIONS.

Captain Bernier's Proposed Expedition.—We have received from Captain Bernier, whose proposed expedition towards the north pole was briefly alluded to in the last number of the *Journal*, some details regarding the plans put forward by him, as well as of the circumstances which have led him to the formation of the design. It may be premised that Captain Bernier has had a large experience in matters relating both to shipbuilding and ice-navigation, having been superintendent in a shipyard during eight winters, and served as ice-pilot on the coasts of Labrador and Newfoundland and in the St. Lawrence river, besides commanding many vessels and visiting the coasts of Greenland. He has for many years paid special attention to arctic voyages, and was in particular interested in the intended voyage of Gustave Lambert by Bering strait in 1867-68, and in that of Delong in the *Jeannette* in 1879-81. These, with the subsequent voyage of Dr. Nansen in the *Fram*, have been the means of turning his thoughts to the possibilities of a successful voyage northward by the Bering strait route, advantage being taken of the drift which carried the *Fram* across the polar basin. By making the start further eastward than the *Fram*, Captain Bernier hopes to pass over the position of the pole itself. He proposes to build a small ship of about 250 to 300 tons, possibly of steel, on the special lines used in the construction of the *Fram*, but with some improvements. The crew will consist of twelve carefully selected men, including the scientific staff, whose work will consist of dredging and sounding, determinations of temperature both of the water and air, the study of ice-formation, drift, *aurora borealis* and magnetism, and many other observations. Buoys with records will be left all along the route, in order to test the rate of the currents, and the same will be done with reference to air-currents by means of small balloons. Any islands discovered would be, of course, surveyed. Surveying parties will also be despatched across the ice, communication with the ship being maintained by wireless telegraphy, and provisions carried in hollow tubes of aluminium to be left at 1-mile intervals along the route. The time necessary for the voyage is estimated at four years. Captain Bernier, who comes of a family of sea-captains, over 300 years of service having been made up by his own and the two preceding generations, brings unbounded enthusiasm to his task. As stated last month, he hopes to have the financial support of the Canadian Government.

GENERAL.

Medal awarded to Dr. Donaldson Smith.—At a recent meeting of the Philadelphia Geographical Society, the Elisha Kent Kane medal, awarded by the

Society to distinguished explorers, was presented to Dr. Donaldson Smith for his valuable surveys in East Africa. The president of the Society, by whom the presentation was made, is the only surviving member of the Kane Polar expedition in honour of whose leader the medal was instituted. A large part of Dr. Smith's collections will be presented by him to the Philadelphia Academy of Natural Sciences.

Death of Otto Kersten.—One of the pioneers of exploration in East Africa has lately passed away in the person of Otto Kersten, the companion of Baron von der Decken in his well-known journeys to Mount Kilimanjaro and the Jub river. From a short notice of the traveller by Dr. R. Andree, which appears in a recent number of *Globus*, we learn that Kersten, who at the time had just completed his course of scientific study at Berlin, was recommended to Von der Decken as travelling companion by the famous explorer Barth. After the death of his leader in East Africa, Kersten, assisted by a staff of scientists, brought out the excellent account, in four volumes, of Von der Decken's journeys. He has since been zealous in the promotion of German interests in East Africa, and even so far back as 1869 had formed a project for the acquisition of territory for Germany in that region. For a time he was chancellor of the German consulate at Jerusalem, but, apart from a journey to Marocco with his wife in 1883, lived most of his time either at Berlin or at his paternal town of Altenburg, where he died on November 22 last, aged sixty-one.

Death of the Surgeon of the Borchgrevink Expedition.—We regret to learn that Dr. Herlof Klövstad, surgeon of the recent expedition under Mr. Borchgrevink to South Victoria Land, died on December 29 last at Tromsø, at the age of thirty-two, of typhus fever. He had proved a most efficient member of the staff of the expedition, besides endearing himself to all his associates by his genial character, and to him was due the discovery that insects exist in South Victoria Land. His death is the third, including that of Dr. Hanson, who died during the wintering in the antarctic, which has occurred among the members of the expedition.

A New Anthropological Publication.—Under the simple but comprehensive title *Man*, the Anthropological Institute has commenced the publication of a new serial devoted to the furtherance of Anthropological Science. It will be issued in monthly parts, and the first of these, which appeared in January, consists of 16 pages of large 8vo. size. It is well printed and provided with several illustrations, including a heliochrome plate. The contents are for the most part reviews, but interspersed with these are a certain number of original communications. A somewhat novel practise is adopted for purposes of reference, each review or article receiving its own number, which may be quoted instead of the page on which it appears. The new publication should do good service in popularizing the important study of Mankind.

OBITUARY.

Luciano Cordeiro.

In Luciano Cordeiro, who died at Lisbon on December 22, Portugal has lost one of her most distinguished geographers. Born on June 21, 1844, at Mirandella, a

picturesque little town of Traz-os-Montes, Cordeiro received his early education at Lisbon and Funchal. He entered the Royal Navy as an Aspirante (midshipman), but soon retired from the service, and, having passed through the Escola superior de Letras of Lisbon, determined to devote his energies to the pursuit of literature, journalism, and geographical studies. For a time he occupied the chair of philosophy and literature of the Military College, and one of his earliest publications was a collection of bright essays, '*Livro de Critica*' (Lisbon, 1869-71). In 1873 he founded the *Revista de Portugal e Brasil*, but only two volumes of this promising magazine saw the light. A leisurely journey through Spain, France, southern Germany, and Italy was described by him in a work of travels, '*Via-gems*' (Lisbon, 1874-5). In 1879-80 Cordeiro was editor of an important daily paper, the *Jornal de Commercio*, and subsequently he edited the *Diario de Lisboa*. Having been elected a member of the Chamber of Deputies, he vigorously stood up in defence of Portuguese claims in Africa, and wrote a number of pamphlets in the vain hope of convincing foreign powers of their justice. In 1884 he was one of the representatives of Portugal at the Berlin Congress.

But what entitles him more especially to recognition among geographers is the foundation of the Lisbon Geographical Society in 1875, for it was mainly due to his indefatigable exertions that this society, notwithstanding its occasional incursions into the domain of politics, has done much to extend our knowledge of the Portuguese colonies. Cordeiro was elected its first secretary, and held that honourable position up to his death. Numerous papers were communicated by him to the *Boletim* of that society, or published by it separately. Nearly all of these will be found in our library, but only the more important need be mentioned in this obituary. In 1878 he published '*L'hydrographie africaine au Siècle xvi.*' by which he sought to prove that the Portuguese, long before the days of Livingstone, had a fair knowledge of the interior and its vast lakes. The attempt proved a failure. D'Anville in 1737, Ludolfus even earlier, had rejected these claims, and competent modern geographers felt bound to agree essentially with their verdict. In 1881 Cordeiro published '*Memorias do Ultramar*,' a collection of documents for the most part hitherto unpublished, dealing with Portuguese explorations and enterprise in Western Africa, and especially in Congo and Angola, between 1516 and 1622. In 1892 he published essays on Vasco da Gama, and his elevation to the peerage as Conde de Vidigueira; on Diogo d'Azambuja, the builder of the famous Fort of Elmina; and the pillars erected by Diogo Cão. His contribution to the Fourth Centenary of the Discovery of India was an account of the loss of Ormuz ('*Como se perdeu Ormuz*') in 1622, and of the action brought by the Portuguese Government against Jorge de Albuquerque, whose father was held responsible for the loss, because he had neglected to furnish means for the defence of the place. Shortly before Cordeiro's death appeared the first instalment of '*Annotações Historicas*,' another collection of documents illustrating Portuguese history. These essays and collections of documents, together with their valuable commentaries, no writer on early Portuguese geographical explorations or colonial history can afford to neglect.

In 1887 the Lisbon Geographical Society awarded its founder a gold medal "in recognition of his services to civilization and the fatherland."* The Royal Geographical Society recognized his merits by electing him one of its corresponding members.

E. G. R.

* See Borges de Figueiredo's '*Homenagen a Luciano Cordeiro*,' with portrait, 1887.

Serpa Pinto.

Alexandre Alberto da Rocha de Serpa Pinto, the well-known African explorer, who died at Lisbon in December, was born on April 20, 1846, at Castel Polchras on the Douro. In 1848 his family emigrated to America. On their return, in 1858, Serpa Pinto entered the Military College, and in 1864 received a commission in a battalion of Chasseurs. In 1869 he was attached to a column of Portuguese troops operating against revolted natives on the lower Zambezi. It was intended that on the termination of this war Serpa Pinto should be placed at the head of an expedition charged with a survey of the upper Zambezi, but this intention was never carried out, and he returned to Europe after a "hasty run through the Portuguese possessions of East Africa."

His ardent desire, however, to take a share in the exploration of Central Africa was to be fulfilled a few years later. In 1877 Lieut. H. Capello, of the Portuguese navy, was placed at the head of an expedition the main object of which was the exploration of the upper Kunene and the Kwango, and with him were associated Captain Serpa Pinto and Lieut. R. Ivens. The explorers left Beaguella on November 12, 1877, but very soon the relations between Serpa Pinto and his colleagues became strained. Serpa Pinto complained that he had been abandoned in Caconda, absurdly described as a "dangerous and hostile country," although he had with him the best men of the expedition. Fresh disagreements arose in Bihe, and the explorers parted company. Capello and Ivens, in accordance with their instructions, turned to the northward, doing most excellent service, whilst Serpa Pinto, fired no doubt by the fame recently won by Cameron and Stanley, turned his face eastward. On June 14, 1878, he crossed the Kwanzo, and on August 24 he arrived at Lialui, the capital of the Marutse. This route, no doubt, had been traversed before by Silva Porto and by other traders from Bihe, but it is Serpa Pinto's merit to have laid it down for the first time with approximate correctness upon a map.

The explorer intended to continue still further east, as far as the meridian of Zumbo, but his intentions were frustrated, as he avers, by the intrigues of Silva Porto's negroes, whose hostility had been aroused by his "unceasingly waging war against his traffic in slaves." His camp was attacked on September 6, and soon afterwards all his carriers deserted him. Fortunately the king of the Marutse proved his friend, and furnished him with boats, which enabled him to descend the Zambezi. When he reached the camp of the Rev. F. Coillard, on October 20, he had come to the end of his resources, and he speaks of this enterprising missionary as "the man who saved him, and in doing so saved the labours of the expedition which I directed." Serpa Pinto arrived at Pretoria on February 12, 1879, which was at that time occupied by British troops, and on April 19 embarked at Durban for Europe. The results of this expedition were published in London in 1881, both in Portuguese and English ('Como eu atravessei Africa' and 'How I crossed Africa'), and having been translated into French, German, and Italian, won the author universal fame as one of the most successful African explorers. The Royal Geographical Society awarded him the Founder's Medal in 1881, and elected him as hon. corresponding member.

A second opportunity for winning fame as an explorer was afforded Serpa Pinto in 1884, when he was placed at the head of an expedition whose object it was to explore the region between Mozambique and the Nyasa, and possibly also the country beyond that lake. After much delay caused by the difficulty of procuring carriers, the expedition left Mozambique on November 13, 1884, and following the coast, arrived at Kisanga, opposite Ibo, on February 14, 1885. Serpa Pinto,

owing to ill health, was compelled to retire from the leadership and the command devolved upon Lieut. Cardozo, who, bravely struggling against difficulties, managed to conduct his caravan to Lake Nyasa. In February, 1886, he turned up at Blantyre, with three men only, in search of food, and thence returned straight to Kiliman, where he arrived in May.

Once more we meet with Serpa Pinto in Eastern Africa, in 1890, at the head of a military expedition, prepared to extend Portuguese influence along the Shire to the northward. His plans, however, were defeated by the decisive action of Sir H. Johnston; and by the treaty of May 28, 1891, the upper Shire and the western shore of Nyasa were recognized as lying within the British sphere.

E. G. R.

The Hon. David Carnegie.

It is with deep regret that we record the death, which occurred in Nigeria on November 27 last year from a wound by a poisoned arrow, of the Hon. David Carnegie, youngest son of the Earl of Southesk, one of the most promising and successful of the younger generation of British pioneers in new lands. Although not yet thirty years old at the time of his death, Mr. Carnegie had made his mark as both a capable organizer and leader, having, during the course of his work in Nigeria, been singularly successful in gaining the love and respect of those under him, his influence over whom is described as almost magical.

Born in London on March 23, 1871, David Carnegie was educated at the Charterhouse and at the Royal Indian Engineering College at Cooper's Hill, at the latter of which he paid special attention to surveying. It was not long before his studies in this direction were turned to good account, for, having in 1892 taken up an appointment in connection with certain of the goldfields of Western Australia, he soon turned his attention to prospecting in the less known districts of the colony. In 1896 he organized, entirely at his own expense, a more important undertaking in the form of an exploring expedition through previously unvisited portions of the great Australian desert. The party led by him consisted entirely of his own men, and the journeys were conducted without loss, save of one man who died from an accident, and three camels that were poisoned. Starting from a point due north of Coolgardie, in $28\frac{1}{2}^{\circ}$ S., the expedition soon plunged into the great spinifex desert, which was crossed from south-west to north-east, or diagonally to the routes of the few preceding explorers of this region, almost to 18° S.; the return route being varied so as to extend the area of the surveys. The journey was one requiring a large amount of pluck owing to the known scarcity of the water-supply, which makes the explorer in this region dependent entirely on his camels for safety and success. The results were valuable from a geographical point of view, although naturally no startling discoveries could be expected. Mr. Carnegie described his journey at a meeting of the Society in February, 1898, and his paper, illustrated by his own vivid sketches of scenery, was shortly afterwards published in the eleventh volume of the *Journal*. A fuller account was subsequently given in the excellently written volume entitled 'Spinifex and Sand.'

About a year ago Mr. Carnegie obtained an appointment under General Lugard in the Nigeria Protectorate, and a new field for pioneer work of the kind for which he was so peculiarly fitted was opened to him. On returning from a tour through the west of Ilorin, he received the special commendation of the Commissioner, who expressed himself much pleased with his survey and report. He also gained the confidence of the natives in a surprising degree, and pressing requests were received by Sir F. Lugard from the Emir of Ilorin that he might be sent back to that

district. Among other work entrusted to him was the settlement on behalf of the Government of Nigeria of the frontier between that Protectorate and Lagos. According to the latest news received, it was on November 22 that Carnegie was entrusted with the mission which was soon to end so tragically. A native chief had been raiding on the bank of the Niger, some 25 miles from Lokoja, whence Mr. Carnegie was despatched with a small force to quell the disturbance. The refractory chief had fled, but complaints having been made of the conduct of the King of Tawaii, Mr. Carnegie resolved to proceed thither and arrest him. The place was found deserted, and the return march was begun, but the small party was at once attacked by concealed natives, the leader being hit by an arrow on the thigh. Fifteen minutes later he was dead, but his body was gallantly rescued and brought to Lokoja by his devoted followers. By his death a most promising career has been cut short.

CORRESPONDENCE.

The Circumnavigation of Africa related by Herodotus.

I WISH to make a contribution to the literature of this much-disputed narrative, to which Dean Vincent devoted considerable space in his book, in order to disprove the possibility of the voyage, and I hope it will appear that after all there is no such great improbability in the story. Prof. Heeren supports the accuracy of the account.*

Dean Vincent was not a traveller or seafaring man, and in his day much less was known about the coasts than at present. It must be remembered that the adventurous voyagers did not go altogether voluntarily, and it would have been death to return with their task unaccomplished; and also that the voyage was far less difficult than the voyage in the opposite direction would have proved. I will just quote the account of Herodotus.† “As for Lybia, we know it to be washed on all sides by the sea, except where it is attached to Asia. This discovery was first made by Necos, the Egyptian king (616 B.C.), who sent to sea a number of ships manned by Phœnicians, with orders to make for the pillars of Hercules, and return to Egypt through them, and by the Mediterranean. The Phœnicians took their departure from Egypt by way of the Erythræan sea, and so sailed into the Southern ocean. When autumn came, they went on shore wherever they might happen to be, and having sown a tract of land with corn, waited until the grain was fit to cut. Having reaped it, they again set sail, and thus it came to pass that two whole years went by, and it was not till the third year that they doubled the pillars of Hercules and made good their voyage home. On their return, they declared—I, for my part, do not believe them, but perhaps others may—that in sailing around Lybia they had the sun upon their right hand. In this way was the extent of Lybia discovered.”

It has been before remarked that the mention of the circumstance, to Herodotus so incredible, that a ship sailing to the westward should have the sun on the right hand, affords the strongest proof of the reality of the voyage. I wish to quote here, in comparison with the above, what is known to have been done. It is a quotation from Faria y Souza.‡ “After the taking of Diu, September 21, 1536, there was

* ‘Hist. Researches,’ etc., by A. H. L. Heeren. Oxford: 1833. D. A. Talboys.

† ‘History of Herodotus,’ by Geo. Rawlinson, M.A. 1875.

‡ Kerr’s ‘Collection,’ 1824, vol. vi.

a person named Diego Botello residing at Diu, who was in disgrace with the King of Portugal, on account of its being reported that he intended to go over to the French in hopes of high promotion, as he was very conversant in the affairs of India (evidently so, from what follows). Knowing how earnestly King Joam had desired the establishment of a fort at Diu, he resolved on endeavouring to be the first messenger of this news. For this purpose, having procured a copy of the treaty, and a draught of the intended fort, he embarked in a small vessel, only *sixteen feet and a half long, nine feet broad, and four feet and a half deep*, manned by his own slaves, with three Portuguese and two others, giving out that he was going to Cambaya. But when out at sea, he informed his companions that he meant in this frail bark to traverse the prodigious extent of ocean between India and Portugal, and prevailed on those along with him to concur in his design. Being reduced to unspeakable miseries, the slaves, who were the only mariners on board, entered into a conspiracy to kill him, and even killed one of his servants, but were all slain. Being now without seamen or pilot, he held on his course, and arrived at Lisbon, to the astonishment of every one. Botello was restored to the royal favour for this wonderful action, but received no other reward, and the boat was immediately destroyed, that it might not be known so small a vessel was capable of performing so great a voyage."

The Phœnicians had sufficient skill to navigate the Mediterranean and Red sea—both stormy basins, and there is a presumption, if not more, that they were, from very early times, acquainted with the east coast of Africa and the Mozambique—witness the ruined cities lately discovered in South Africa. That by taking advantage of the seasons, they might round the Cape of Good Hope, and proceed up the western coast of Africa, does not seem to me improbable. If it be asked, why did no practical results follow this wonderful voyage? it may be that it was not found to be of practical use commensurate with the dangers and length of time occupied, or, if it really led to the discovery of the South African goldfields, that it was intentionally kept secret. We know too little about those times to make a conjecture.

I need not refer to the marvellous voyages made of late years in small boats, sometimes with only one occupant. The chief object of this note is to give prominence to Botello's exploit, and its correlation with Herodotus' story, which I believe to be based on fact, not fiction.

ARTHUR W. STIFFE, late I.N.

Re "The Discovery of the Barriloché Pass."

Under the title of "Discovery of the Barriloché Pass," the *Journal* (vol. xvii. p. 79) contains an abstract of some notes which have appeared in *Globus* (vol. 78, p. 182), and *Petermanns Mittheilungen* (1900, p. 218), in which the rediscovery of the Barriloché pass in the Patagonian Andes is credited to the Chilian, Captain Barrios. This statement is incorrect. I myself, in 1880, discovered on the shores of an unknown lake tributary of Lake Nahuel Huapi (Lake Gutierrez) some pieces of wood carved by Europeans, and referred to in my geographical publications, I considering them as remains of the rafts of Jesuit missionaries, and the spot as a part of the Barriloché route. In 1898, my assistants, surveying the region to the west of this Lake Gutierrez, rediscovered the famous gap, and photographs of both slopes can be seen on pp. 746 and 747 of the 'Argentine-Chilian Boundary, Argentine Evidence,' published in London last year.

The exploration of Captain Barrios was carried on two years after, he using the tract opened by the Argentine surveyors.

FRANCISO P. MORENO.

January 13, 1901.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Fourth Ordinary Meeting, January 14, 1901.—Sir T. H. HOLDICH, R.E., K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*Edmund Backhouse; Captain Frank Bevan (5th Fusiliers); Ebenezer Clark; Alfred Edwin Clements; William Brownfield Craig; Samuel Blackwell Fenn, L.R.C.P., L.R.C.S.; Salamon Israel; Charles Davis Jameson, C.E.; George Cecil Lyne Pirkis, B.A.; Captain Henry Joseph Wilson; Gustave Zimmer.*

The Paper read was:—

“Explorations in the Canadian Rocky Mountains.” By Prof. Norman Collie, F.R.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.

Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the “Journal.”

EUROPE.

Alps—Morphology.

Richter.

Geomorphologische Untersuchungen in den Hochalpen. Von Dr. Eduard Richter. (Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 132.) Gotha: Justus Perthes, 1900. Size 11 × 7½, pp. vi. and 104. Illustrations. Price 6 m. 40 pf.

This will be specially noticed.

- Alps—Soil and Vegetation.** *Die Natur* 49 (1900): 577–578. —
 Beziehungen zwischen Bodenbeschaffenheit und Flora in den Alpen.
- Austria—Croatia.** *Deutsche Rundschau G.* 23 (1900): 108–111. **Hranilović.**
 Der Švicasee in Kroatien. Von Dr. H. v. Hranilović.
 Lake Švica lies among the spurs of the Belebit, near the town of Otočac.
- Austria—Hungary.** *Questions Dipl. et Colon.* 10 (1900): 86, 142, 463, 529. **Beaumont.**
 La problème austro-hongrois et sa portée européenne. Par W. Beaumont.
- Belgium—Place-names.** *B.S.G. Lille* 34 (1900): 286–294. **Houbron.**
 Zigzags étymologiques à travers la Flandre. Par M. G. Houbron.
- France—Gironde.** *B.S.G. Com. Bordeaux* 26 (1900): 420–424. **Courty.**
 Régime de la température dans le département de la Gironde. Par F. Courty.
- France—Havre.** *Questions Dipl. et Colon.* 10 (1900): 657–673. **Hanotaux.**
 Le Havre et le commerce maritime de la France. Par G. Hanotaux.
- France—Paris Basin.** *Ann. G.* 9 (1900): 313–339, 413–433. **Dollfus.**
 Relations entre la structure géologique du bassin de Paris et son hydrographie.
 Par G. F. Dollfus. *With Maps.*
- France—Rhône Valley.** *B.S.G. Lille* 34 (1900): 205–233. **Ronjat.**
 La vallée du Rhône de Lyon à Avignon. Par M. Jules Ronjat. *Map.*
- Germany—Coasts.** *Ann. Hydrographie* 28 (1900): 536–541. **Herrmann.**
 Die Eisverhältnisse an der deutschen Küste im Winter 1899–1900. Von E. Herrmann.
- Germany—Elbe.** *La G., B.S.G. Paris* (1900): 363–370. **Chudeau.**
 L'Elbe, son régime et son importance économique. Par M. R. Chudeau.
 Based on the recent German official publication on the Elbe (see *Journal*, vol. xvi. p. 552).
- Germany—Harz Mountains.** *J. Manchester G.S.* 16 (1900): 69–105. **Mellor.**
 The Harz Mountains, with Brunswick and Hildesheim. By E. W. Mellor. *With Sketch-map and Illustrations.*
- Germany—Lakes.** *Globus* 78 (1900): 121–127. **Werner.**
 Die oberelsässischen Seen und Stauweiher. Von L. G. Werner. *Illustrations.*
 A description of the lakes of the upper region of the Vosges, now for the most part converted into reservoirs.
- Germany—Prussia.** **Cohen and Deecke.**
VII. Jahresb. G. Ges. Greifswald (1898–1900): 41–46.
 Liste der häufigeren Rügen'schen Diluvial-geschiebe. Von E. Cohen und W. Deecke. *With Map.*
- Germany—Prussia.** *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 1–9. **Credner.**
 Lage, Gliederung und Oberflächengestaltung der Insel Rügen. Von Rudolf Credner. *With Map.*
- Germany—Prussia.** *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 10–40. **Deecke.**
 Die geologische Zusammensetzung und Schichtenfolge der Insel Rügen. Von W. Deecke.
- Germany—Prussia.** *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 142–157. **Metzner.**
 Die älteste Stadtbeschreibung von Greifswald. Von J. E. Metzner.
 The account of Greifswald here referred to was written about 1593 by Lucas Takke.
- Germany—Prussia.** **Reifferscheid.**
VII. Jahresb. G. Ges. Greifswald (1898–1900): 99–141.
 Aus der Geschichte zweier Dörfer in Pommern. Ein Beitrag zur pommerschen Heimatskunde. Von Geheimrat Dr. A. Reifferscheid. II.
 Historical sketch of Lubmin, a Baltic watering-place. A former article in the same publication treated of Fresendorf.
- Germany—Prussia.** *G.Z.* 6 (1900): 435–449, 504–512, 549–565. **Stavenhagen.**
 Die geschichtliche Entwicklung des preussischen Militär-Kartenwesens. Von W. Stavenhagen.
 A full and clear account of the progress of military cartography in Prussia.

Germany—Prussia—Masuren.**Zweck.**

Masuren. Eine Landes- und Volkskunde, von Dr. Alb. Zweck. (Deutsches Land und Leben in Einzelschilderungen. Landschaftskunden und Städtegeschichten.) Stuttgart: Hobbing & Büchle, 1900. Size $8\frac{1}{2} \times 6$, pp. vi. and 358. *Maps and Illustrations.* Price 7s.

This is one of a series of studies in regional geography which are to be devoted to various parts of the German Empire. It deals with the south-eastern portion of the province of East Prussia, inhabited by the Mazures, a Polish people whose occupation dates, in its first beginnings, from the fourteenth century. The work begins with a clear sketch of the physical features of the country, which includes a portion of the ridge of comparatively elevated ground parallel to the Baltic coast, and also a depressed area largely occupied by lakes. The last half of the book treats very fully of the various elements of the population, its history, industries, culture, etc.

Germany—Prussia—Silesia. *Globus* 78 (1900): 297-300, 321-325.**Tetzner.**

Die Tschechen und Mährer in Schlesien. Von Dr. F. Tetzner. *With Illustrations.*

Germany—Schleswig-Holstein.

Excursion nach Ost-Schleswig-Holstein und der Insel Sylt am 5.—10. Juni 1900. (XVII. Excursion der Geographischen Gesellschaft zu Greifswald.) Greifswald, 1900. Size 9×6 , pp. 22. *Maps.*

The excursion described was undertaken for the comparative study of the coasts and islands of the North sea and Baltic.

Greece—Paxos and Antipaxos.**Martelli.**

Atti R.A. Lincei, Rendiconti 9 (2 Sem.) (1900): 282-286.

Note geologiche su Paxos e Antipaxos nelle Isole Ionie. Nota del Dott. Alessandro Martelli.

Italy—Lakes.*Riv. G. Italiana* 7 (1900): 450-468.**Marinelli.**

Seconda serie di aggiunte e correzioni al Catalogo dei laghi italiani. Di Olinto Marinelli.

Revision of the statistical data relative to the Italian lakes published in 1894-95.

Portugal—Bragança. *B.S.G. Lisboa* 17 (1898-1899): 151-264.**Lopo.**

Bragança e Bemquerença. Por Albino dos Santos Pereira Lopo. *With Map, Plans, and Illustrations.*

Descriptive and Historical notes on Bragança and its buildings, particularly the fortifications.

Rumania.*Globus* 78 (1900): 117-121.**Weigand.**

Bulgarische Siedelungen in Rumänien. Von Prof. G. Weigand. *Illustrations.*

Russia.**Woodhouse.**

Waterway between the Baltic and Black Sea. Foreign Office, Miscellaneous, No. 529, 1900. Size $10 \times 6\frac{1}{2}$, pp. 12. Price 1d.

See note in *Journal*, vol. xvi. p. 554.

Switzerland—Jura. *Scottish G. Mag.* 16 (1900): 630-651.**Dingelstedt.**

The Valley of the Joux (Jura). By Victor Dingelstedt.

A clear sketch of the physical geography of the Joux valley, and the effect this has had on its inhabitants.

United Kingdom—Coal. *La G., B.S.G. Paris* (1900): 356-362.**Levasseur.**

La houille britannique et la question de l'épuisement. Par M. E. Levasseur.

Without committing himself to any estimate of the duration of the coal-supply of Great Britain, M. Levasseur dwells on the need of husbanding the same.

United Kingdom—Mines and Quarries.**Foster.**

Mines and Quarries: General Report and Statistics for 1897. Part iv.—Colonial and Foreign Statistics. Statistics relating to persons employed, output, and accidents at Mines and Quarries in the British Colonies and in Foreign Countries. Edited by C. Le Neve Foster, D.Sc. London: Eyre & Spottiswoode, 1899. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 273-416. *Diagrams.* Price 1s. 7d.

United Kingdom—Mines and Quarries.**Foster.**

Mines and Quarries: General Report and Statistics for 1899. Part iii.—Output. General Report and Statistics relating to the output and value of the Minerals raised in the United Kingdom, the amount and value of the metals produced, and the exports and imports of Minerals. Edited by C. Le Neve Foster, D.Sc. London:

Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 119-274. *Diagram. Price 1s. 5d.*
Presented by the Home Office.

United Kingdom—Oxford. *P.R.S.* 67 (1900): 218-222. **Rambaut.**

Underground Temperature at Oxford in the Year 1899, as determined by Five Platinum Resistance Thermometers. By Arthur A. Rambaut, D.Sc. [Abstract.]

United Kingdom—South Downs. *P.I. Civil Engineers* 142 (1900): 342-351. **Whitley.**

The Underground Water-Levels of the South Downs between Eastbourne and the River Cuckmere. By H. M. Whitley. *With Plan and Section.*

Recent investigations have shown that, except where the chalk downs are drained by the deep valleys of Friston and Eastdean, the underground water contours roughly follow the surface contours.

United Kingdom—Statistics. **Fox.**

Report by Mr. Wilson Fox on the Wages and Earnings of Agricultural Labourers in the United Kingdom, with Statistical Tables and Charts. London: Eyre & Spottiswoode, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. x. and 296. *Price 3s. 4d.*

ASIA.

Central Asia. **Deasy.**

Journeys in Central Asia. By Captain H. H. P. Deasy. (From the *Geographical Journal* for August and November, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 50. *Map and Illustrations.*

China. *B. American G.S.* 32 (1900): 334-340. **Fischer.**

Through the Silk and Tea Districts of Kiang-Nan and Chekiang Province. By Emil S. Fischer.

On a journey, mainly by boat, from Shanghai to Hang-chau and Ningpo.

China—Chekiang. *B.S.G. Com. Harre* 17 (1900): 39-45. **Richard.**

Le Tche-Kiang. Par M. Garston Richard.

Review of a monograph by Dr. M. Carli, published at Rome in 1899.

China—Liao-tung Peninsula. **Bogdanovitch.**

Description géologique de l'extrémité sud de la presqu'île de Liao-tung (région de Kouang-toung) et de ses gisements d'or. Par K. Bogdanovitch. [In Russian; résumé in French.] *Materialien zur Geologie Russlands.* Herausgegeben von der K. Mineralogischen Gesellschaft. Band xx., pp. 1-248. St. Petersburg, 1900. Size 10×7 .

China—Yunnan. *Rev. Française* 25 (1900): 636-641. **Leclère.**

La charbon au Yunnan. Par A. Leclère.

M. Leclère holds that the extensive coal deposits between Tongking and the Yangtse are of a quality not only unknown in Tongking, but rare in Europe or China.

Chinese Empire—Manchuria. *Rev. Française* 25 (1900): 719-723. **Servigny.**

La Mandchourie grenier de l'Amour. Par J. Servigny.

Eastern Asia. **Barthold.**

Russische Arbeiten über Ostasien. Jahresbericht für 1899. Von W. Barthold. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii. Erste Abth. Ostasiatische Studien. Pp. 233-238.) Berlin and Stuttgart: W. Spemann, 1900.

Contains a short summary of the contents of the principal works published in 1899 by Russian scientific societies.

Eastern Asia. **Brandt.**

Dreiunddreissig Jahre in Ost-Asien. Erinnerungen eines deutschen Diplomaten. Von M. von Brandt. Band i. Leipzig: G. Wigand, 1901 [1900]. Size 9×6 , pp. xii. and 320. *Portrait. Price 6s. 6d.*

In this volume the author gives his personal reminiscences of the Prussian mission to Eastern Asia in 1860-62, in which he took part as *attaché*. In view of the attention now focussed on the far East, the account, by a careful observer, of the condition of affairs in that part of the world thirty years ago possesses a considerable interest, if only for the means it affords of comparison between the past and present. The countries dealt with are Japan, China, and Siam.

Japan—Saris's Voyage.**Satow.**

The Voyage of Captain John Saris to Japan, 1613. Edited from Contemporary Records by Sir Ernest M. Satow, K.C.M.G. London: Printed for the Hakluyt Society, 1900. Size 9 × 6, pp. lxxxviii. and 242. *Map and Illustrations. Presented by the Hakluyt Society.*

This voyage possesses a special interest as the first attempt on the part of the East India Company to extend its operations to the Japanese Empire. The introduction contains valuable notes on Saris's previous and subsequent career, and on early European commercial dealings with the Far East.

Malay Archipelago—Java.**Brandes.**

Tijds. Indische Taal-, Land- en Volkenk. 42 (1900): 105-130.

Van Oud-Batavia, losse mededeelingen. Door Dr. J. Brandes.

On the topography of Old Batavia, as shown by views and plans chiefly of the eighteenth century.

Malay Archipelago—Java.**Gelder.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 765-788.

De Residentie Bantam; Plaatsbeschrijving en bevolking. Door W. van Gelder.

Malay Archipelago—Java.**Niermeyer.**

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 735-764.

De vulkaan Idjen in Besoeki. Door J. F. Niermeyer. *With Map and Illustrations.*

On the little-known volcanic group of Ijen in the extreme east of Java.

Malay Archipelago—Java.**Porte and Knebel**

Tijds. Indische Taal-, Land- en Volkenk. 42 (1900): 263-296.

De Ruïnen van Panataran. Aanteekeningen van J. André de la Porte en J. Knebel.

Description of the great ruined temple at Panataran, in the Kediri residency, Java

Malay Archipelago—Magnetism.**Bemmelen.**

K.A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 202-211.

Dr. W. van Bemmelen. "Spasms" in the terrestrial magnetic force at Batavia.

On the probable existence of very small magnetic disturbances not hitherto noticed.

Malay Archipelago—Manila Observatory.**Algué.**

National G. Mag. 11 (1900): 427-438.

The Manila Observatory. By Rev. Father José Algué, S.J. *With Illustrations.*

Sketch of the work done at the Manila Observatory since its inauguration in 1865.

Malay Archipelago—Philippines.**Sawyer.**

The Inhabitants of the Philippines. By Frederic H. Sawyer. London: Low & Co., 1900. Size 9 × 6, pp. xxviii. and 422. *Maps and Illustrations. Price 14s. net. Presented by L. W. Longstaff, Esq.*

The writer, who, during a residence of fourteen years in Luzon, had exceptional opportunities of becoming acquainted with all phases of native and European life in the Philippines, was led to write this book by a wish to set forth the natives in a more favourable light than has been done by most recent writers. This more favourable estimate is extended also in part to the Spanish administration. The first half of the book deals with the general history, geography, resources, etc., of the group, while the second treats in detail of the various tribes, with abundant photographic illustrations.

Malay Archipelago—Sumatra.**Van der Stok.**

K.A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 178-189.

Tidal Constants in the Lampong- and Sabang-bay, Sumatra. By Dr. J. P. van der Stok.

Persia.

Deutsche Rundschau G. 23 (1900): 10-14. **Schulz-Baumgärtner.**

Wie man in Persien reist. Von Dr. W. Schulz-Baumgärtner. *Illustrations.*

Persia.

G.Z. 6 (1900): 537-549.

Stahl.

Persien und seine Beziehungen zu den Nachbarländern. Von A. F. Stahl.

Includes a description of the principal trade-routes and a discussion of the railway question.

Russia—Caucasus. Rev. G. 47 (1900): 100-116, 173-187, 241-257.**Baye.**

Tiflis. Souvenirs d'une mission. Par le Baron de Baye. *With Illustrations.*

Descriptive and Historical notes. The date of the visit is not mentioned.

Russia—Siberia.**Patkanoff.**

Erläuterungen zur ethnographischen Karte des Tobolaischen Kreises. Size 12 × 9, pp. 6. *Map.*

The map is intended to illustrate the description of the Ostiaks of the Irtysh, by the same author.

Russia—Siberian Railway. *Scottish G. Mag.* 16 (1900): 617–630.**Beazley.**

The Siberian Railway. By C. Raymond Beazley.

An account of the history of the Siberian Railway project, with notes on its actual and probable economic results.

Russia—Siberian Railway.**Cooke.**

Trans-Siberian Railway. Foreign Office, Miscellaneous, No. 533, 1900. Size 10 × 6½, pp. 30. *Sketch-map.* Price 3½d.

Sketches the history of the Siberian Railway project and its probable influence on Siberian trade and settlement, with a section on the resources, etc., of the country.

Russia—Siberian Railway. *Deutsche Rundschau G.* 23 (1900): 27–31.**Grunzel.**

Die transsibirische Eisenbahn. Von Dr. Josef Grunzel. *Map and Illustrations.*

Russian Central Asia. *G. Tidskrift* 15 (1899–1900): 177–194.**Olufsen.**

Den anden danske Pamir-Expedition. Af O. Olufsen. *With Map and Illustrations.*

On Lieut. Olufsen's limnological investigations on the Alichur Pamir.

Tian Shan.*G.Z.* 6 (1900): 512–518.**Immanuel.**

Der Tiën-Schan. Von Immanuel.

Summarizes the main results of Dr. Friederichsen's study of the Tian Shan noticed in the *Journal*, vol. xiv. pp. 443, 661.

Turkey—Nikaria Island. *B.S.R.G. d'Anvers* 24 (1900): 329–363.**Hautteœur.**

L'île d'Icaria. Par M. H. Hautteœur.

Based on the Greek work of M. Stamatiades, published in 1893.

Turkey—Palestine—Ancient Map.**Schulten.**

Die Mosaikkarte von Madaba und ihr Verhältnis zu den ältesten Karten und Beschreibungen des heiligen Landes. Von Adolf Schulten. (Abhandlungen der Königl. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-Historische Klasse. N. F. Band iv. No. 2.) Berlin: Weidmannsche Buchhandlung, 1900. Size 11 × 9, pp. 122. *Facsimiles.* Price 9s.

The map here described, which occupied the floor of an ancient church at Madaba east of the Jordan, was discovered in 1896 by Pater Kleophas, librarian of the Greek monastery at Jerusalem.

Turkey—Rhodes.*Tour du Monde* 6 (1900): 457–480.**Launay.**

L'île de Rhodes. Par M. L. de Launay. *With Illustrations.*

Turkey—Syria.*M.G. Ges. Wien* 43 (1900): 194–197.**Blanckenhorn.**

Zur Frage des Untergangs von Sodom und Gomorrha. Von Dr. Max Blanckenhorn.

A reply to Dr. Carl Diener's criticism of a former article of the author on the origin of the Dead sea.

AFRICA.**Africa—South and East Coasts.**

Supplement, 1900, relating to the Africa Pilot. Part iii. Sixth Edition, 1897. London: J. D. Potter, 1900. Size 10 × 6½, pp. 50. Price 8d. *Presented by the Hydrographer to the Admiralty.*

British East Africa—Uganda.**Johnston.**

Preliminary Report by her Majesty's Special Commissioner on the Protectorate of Uganda. (Africa, No. 6, 1900.) London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 16. Price 2d. *Maps separate* (Africa, No. 8, 1900). Price 1s. 6½d.

This is specially referred to, *ante*, p. 191.

British West Africa—Gold Coast.**Hunter.**

Gold Coast. Report for 1899. Colonial Reports, Annual No. 306, 1900. Size 10 × 6, pp. 26. Price 2d.

The exports for 1899 show an increase of 12 per cent. over those for 1898, an improvement being recorded in the value of each of the principal items, palm oil, palm kernels, and rubber, especially the two former. The export of timber has, however, somewhat declined.

Cape Colony. *T. South African Philosoph. S. 11* (1900): 125-160. **Juritz.**

The Chemical Composition of the Soils of the South-Western Districts of the Cape Colony. By Chas. F. Juritz. *With Diagrams.*

The results of these investigations show that the great want of most of the Cape soils, from an agricultural point of view, is phosphatic material, and next to this, lime.

Cape Colony—Glaciation. **Rogers and Schwarz.**

T.S. African Philosoph. S. 11 (1900): 113-120.

The Orange River Ground Moraine. By A. W. Rogers and E. H. L. Schwarz. *Plates. Also separate copy, presented by the Author.*

On a remarkable conglomerate in Prieska and Hope Town divisions, the rock surfaces beneath which give evidence that the country was in past ages traversed by land-ice.

Congo. *Mouvement G. 17* (1900): 517-521. **[Wauters.]**

La source du Congo. *With Map.*

An argument in favour of the view that the Kuleshi is the real source of the Congo.

Congo basin. *Globus 78* (1900): 304-305. **Singer.**

Zur Kenntnis des Kongo-quellengebietes. Von H. Singer.

On the results of the Lemaire Expedition in the Southern Congo basin.

French Congo—Likuala. *Mouvement G. 17* (1900): 565-568. **Jobit.**

L'exploration de la Likuala aux Herbes. Par Capitaine E. Jobit.

On the journey alluded to in the *Journal* for January, p. 73.

Italian East Africa—Eritrea. **Melli.**

Tenente B. Melli. La Colonia Eritrea dalle sue origini fino al 1° Marzo 1899.

Parma: L. Battei, 1899. Size 8 × 5½, pp. xviii. and 362. *Maps. Price 2s.*

A useful compilation on the history of Eritrea.

Madagascar. *B.S.G. Marseille 24* (1900): 125-163. **Jully.**

Réception du général Galliéni, conférence de M. Jully sur Madagascar au point de vue économique.

North Africa. *G.Z. 6* (1900): 611-626. **Kürchhoff.**

Das französische Kolonialreich in Nord-Afrika und die transaharische Eisenbahn. Von Oberleutnant a. d. Kürchhoff.

A concise sketch of French political aims in North Africa.

Portuguese Colonies. *Questions Dipl. et Colon. 10* (1900): 257-272. **Hauser.**

Études sur les colonies portugaises: Iles du cap vert, Guinée, Saô-Thomé. Par M. Henri Hauser.

Portuguese East Africa. **Robins.**

Mission Field 45 (1900): 307-309, 337-346, 388-394, 422-428.

Through Gorongosa and the Land of the Barue. By the Rev. W. H. Robins. *With Map and Illustrations.*

Notes of a journey made in 1899 in the country between the Pungwe and Zambezi, with return through Eastern Mashonaland.

Portuguese West Africa. **Sanders.**

K.A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 398-406.

Determination of the latitude of Ambriz and of San Salvador (Portuguese West Africa). By C. Sanders.

By circummeridian altitudes of the sun as well as meridian altitudes of the sun and of a Crucis, taken with a sextant, the observer obtained, as a final result for the latitude of Ambriz, 7° 50' S., as compared with 7° 52' 9" given on the Admiralty chart. Three meridian altitudes gave the latitude of San Salvador, at a point 1 kil. north of the centre of the town, as 6° 15' 16".

Sahara. *Naturw. Wochenschrift 15* (1900): 517-520. **Werner.**

Aus dem Thierleben der Sahara. Von Dr. Franz Werner.

Seychelles. *M.G. Ges. Wien* 43 (1900): 163-180. **Zaffank.**

Die Seychellen. Von Josef Zaffank.

The author, an officer in the Austrian navy, after describing the Seychelles and their inhabitants, puts forward the theory that the group marks the site of the terrestrial paradise.

South-East Africa—Ophir. *Deutsche Rundschau* 23 (1900): 1-10. **Schiller-Tietz.**

Das wiederentdeckte Goldland "Ophir." Von Schiller-Tietz.

A historical sketch of the gold regions of South-East Africa, and their identification with the ancient Ophir.

Tropical Africa—Commeroe. *Scottish G. Mag.* 16 (1900): 651-657. **Heawood.**

The Commercial Resources of Tropical Africa. By Edward Heawood, M.A.

NORTH AMERICA.

America—Historical. **De Roo.**

History of America before Columbus, according to Documents and Approved Authors. By P. De Roo. 2 vols. Vol. i. American Aborigines; Vol. ii. European Immigrants. Philadelphia and London: J. P. Lippincott Co., 1900. Size 9 × 6, pp. (vol. i.) l. and 614; (vol. ii.) xxiv. and 614. *Maps and Illustrations.* Price 30s. net. Presented by the Publishers.

The documents alluded to in the title of this work are principally those contained in the Vatican Archives, the examination of which first drew the writer's attention to the subject of the early history—especially the religious history—of America. From a subsequent study of published writings on the subject, Mr. de Roo was led to the conclusion that material exists for a much fuller knowledge of ancient America than is generally supposed. In the first volume he deals with the American aborigines, and is at much pains to prove that the rites observed in Mexico, etc., at the time of the conquest, point to a prehistoric knowledge of Christianity in those countries. Dismissing the idea that this may have been derived from China, he seeks in the second volume to show its European origin, holding that the legend of St. Brandan has a basis of fact, and that ancient Irish settlements existed in America before the arrival of the Scandinavians. A vast amount of information is brought together in the work, but few of the writer's conclusions can be accepted without reserve.

Mexico. *Globus* 78 (1900): 205-209. ———

Starrs Arbeiten über die Indianer des südlichen Mexiko. *With Illustrations.*

A review of two works by Prof. Starr of Chicago University, dealing with the Otomis and sixteen other tribes of Southern Mexico.

North America—Fur Trade. *Die Natur* 49 (1900): 555-558. **Notzke.**

Pelzjäger und Pelzjagd im amerikanischen Norden. Von G. C. Notzke.

North America—Plant Geography. *Science* 12 (1900): 830-842. **Kearney.**

Plant Geography of North America. III. The Lower Austral Element in the Flora of the Southern Appalachian Region. A preliminary note. By T. H. Kearney, Jr.

United States. *Petermanns M.* 46 (1900): 245-246. ———

Städte der Vereinigten Staaten mit mehr als 50,000 Einwohnern nach der Zählung im Juni 1900.

United States—Alaska. ———

Alaska. Coast Pilot Notes on the Fox Islands Passes, Unalaska Bay, Bering Sea, and Arctic Ocean as far as Point Barrow. Prepared by the Coast and Geodetic Survey, and Revised by Lieut. D. H. Jarvis. (Bulletin No. 40.) Washington, 1900. Size 11½ × 9½, pp. 60. *Plates.* Presented by the Survey.

United States—Arid Region. *National G. Mag.* 11 (1900): 438-442. **Newell.**

The limited Water Supply of the Arid Region. By Frederick H. Newell.
On irrigation schemes and possibilities in the Western United States.

United States—Census. *Petermanns M.* 46 (1900): 272. ———

Vorläufige Ergebnisse der Volkszählung in den Vereinigten Staaten im Juni 1900.

United States—Colorado. *J. Geology* 8 (1900): 647-654. **Lee.**

The Glacier of Mount Arapahoe, Colorado. By Willis T. Lee. *With Illustrations.*
Observations made during an ascent in August, 1900.

- United States—Forestry.** *G.Z.* 6 (1900): 626-634. **Hausrath.**
 Wald und Waldschutz in den Vereinigten Staaten von Nord-Amerika. Von Prof. Dr. H. Hausrath.

Discusses the steps taken for forest-protection in the United States, and points out their insufficiency for the object in view.

- United States—Louisiana.** **Harris and Veatch.**

Part v.—Geology and Agriculture. A Preliminary Report on the Geology of Louisiana [1899]. By Gilbert D. Harris and A. C. Veatch. Made under direction of State Experiment Station, Baton Rouge, La. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 354. *Maps and Illustrations. Presented by A. C. Veatch, Esq.*

Based on field-work commenced in 1898. The report opens with a historical review of geographical research in Louisiana.

- United States—Texas.** *National G. Mag.* 11 (1900): 442-445. **Greely.**

Hurricanes on the Coast of Texas. By General A. W. Greely.

On the hurricane of September 15-16, 1875.

CENTRAL AND SOUTH AMERICA.

- Argentine Republic.** **Cisneros and Garcia.**

Geografia Comercial de la América del Sur. Por Carlos B. Cisneros y Romulo E. Garcia. Segunda Entrega. Republica Argentina. Lima, 1897. Size $9 \times 6\frac{1}{2}$, pp. 100.

The absence of a table of contents or any clear subdivision much detracts from the usefulness of this work.

Bolivia.

Propuesta de Guillermo Arning y Cia para la construccion de un ferrocarril de la Laguna Gaiba á Santa Cruz de la Sierra, etc. Buenos Aires, 1900. Size $11 \times 7\frac{1}{2}$, pp. 32. *Map.*

On railway projects for the opening up of the districts between the upper Mamore and the Paraguay.

- Brazil—Ethnology.** *Ymer* 20 (1900): 260-279. **Freyreiss.**

Bidrag till Kannedomen om Brasiliens urbefolkning. Skildringar från en resa i Minas Geraes 1814-1815 af G. W. Freyreiss. *With Map and Illustration.*

- British Honduras.** *B. American G.S.* 32 (1900): 331-333. **Avery.**

British Honduras. By W. L. Avery.

- Chile—Atacama Desert.** *Deutsche Rundschau G.* 23 (1900): 111-115. **Greger.**

Die Puna de Atacama. Von J. Greger. *With Map.*

- Chile—Copper.** *B.S.G. Com. Havre* 17 (1900): 111-126.

L'industrie du cuivre au Chili.

The progress of the copper industry in Chili is shown by the fact that the export of ore fell from 52,300 metric tons in 1876 to 21,900 in 1897.

AUSTRALASIA AND PACIFIC ISLANDS.

- Fiji Islands.** *J.R. Colonial I.* 32 (1900): 37-57. **Finucane.**

The Islands and the People of Fiji. By Morgan I. Finucane.

- New South Wales—Gold.** **Pittman.**

Records Geolog. Surv. New South Wales 7 (1900): 1-9.

The Auriferous Deposits of Lucknow. By E. F. Pittman. *With Plan.*

The mines at Lucknow are about 6 miles from Orange, on the Western railway.

- New South Wales—Gold.** **Pittman.**

Records Geolog. Surv. New South Wales 7 (1900): 9-15.

The Auriferous Ore-beds of the Lyndhurst Goldfield. By E. F. Pitmann. *With Illustrations.*

These deposits, situated on the Belubula river, 8 miles from Carcoar, are among the most remarkable in New South Wales.

- Queensland—Brisbane River.** *P.I. Civil Engineers* 142 (1900): 292-296. **Cullen.**

The Removal of the Lytton Rocks, Brisbane River. By E. A. Cullen. *Illustr.*

An account of the operations undertaken in 1896 for the improvement of the navigation of the Brisbane river. The total quantity of rock removed was 27,310 cubic yards, the channel formed being 300 feet wide, with a minimum depth of 20 feet.

- Queensland—Brisbane River.** *Queensland G.J.* 15 (1899-1900): 41-54. **Gregory.**
 Mitigation of Floods in the Brisbane River. By the Hon. A. C. Gregory, C.M.G.
- Queensland—Brisbane River.** *Queensland G.J.* (1899-1900): 75-114. **Nelson and Oxley.**
 Anniversary address to the Royal Geographical Society of Australasia, Queensland, 1900. By the Rt. Hon. Sir Hugh M. Nelson. *With Appendix and Map.*
 On the early history of discovery of the Brisbane river, with transcript of the autograph journal kept by Lieut. Oxley in 1824.
- Samoa.** *National G. Mag.* 11 (1900): 417-426. **Morgan.**
 The Samoan Islands. By Edwin V. Morgan.
- South Australia—Yorke Peninsula.** **Howchin.**
T.R.S. South Australia 24 (1900): 71-80.
 Evidences of Extinct Glacial Action in Southern Yorke's Peninsula. By Walter Howchin.
- Torres Strait.** *Queensland G.J.* 15 (1899-1900): 25-40. **Douglas.**
 The Islands and Inhabitants of Torres Strait. By the Hon. John Douglas, C.M.G.
- Victoria.** *P.I. Civil Engineers* 142 (1900): 326-333. **Gordon.**
 Irrigation in Victoria. By George Gordon.
 In spite of the seeming failure of irrigation undertakings in Victoria, the writer is sanguine of success, given an improvement in the present system of management.
- Western Australia.** *J.R. Colonial I.* 32 (1900): 10-36. **Smith.**
 Recent Observations in Western Australia. By Lieut.-Colonel Sir Gerald Smith, K.C.M.G.
- Western Australia—Year-Book.** **Fraser.**
 Western Australian Year-Book for 1898-99. (Eleventh Edition.) By Malcolm A. C. Fraser. Vol. ii. Perth, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 370. *Illustrations. Presented by the Western Australian Government.*

POLAR REGIONS.

- Arctic—Abruzzi Expedition.** *Riv. G. Italiana* 7 (1900): 529-539. **Toni.**
 Spedizione del Principe Luigi di Savoia Duca degli Abruzzi al Polo Nord, di Mons. G. Toni.
- Arctic—Andrée's Expedition.** *Ymer* 20 (1900): 303-324. **Nathorst.**
 De hittills funna flytbojarne från Andrée-expeditionen. Af A. G. Nathorst. *With Map and Illustration.*
 On the Andrée buoys so far discovered.
- Arctic—Greenland.** **Åkerblom.**
 Positions géographiques déterminées par des observations astronomiques faites pendant l'expédition Suédoise au Grönland en 1899. Par Filip Åkerblom. (From 'Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar 1900.' No. 6. Stockholm. Pp. 763-788.) Size $8\frac{1}{2} \times 5\frac{1}{2}$. *Presented by the Author.*
 Mr. Åkerblom accompanied Dr. Nathorst in the expedition of which the results are described in the January number of the *Journal*.

MATHEMATICAL GEOGRAPHY.

- Cartography.** *Ann. G.* 9 (1900): 291-312, 385-412. **Margerie and Raveneau.**
 La cartographie à l'Exposition universelle de 1900. Par MM. Emmanuel de Margerie et Louis Raveneau.
- Pendulum Observations.** *C. Rd.* 131 (1900): 654-657. **Collet.**
 Sur la correction topographique des observations pendulaires. Note de M. J. Collet.
- Relief Maps.** *B. American G.S.* 32 (1900): 367-380. **Mindeleff.**
 Geographical Relief Maps: their use and manufacture. By Cosmos Mindeleff. *With Illustrations.*
- Solution of Problems.** **Minutilli.**
 Prof. Federico Minutilli. Soluzione grafica di alcuni problemi di Geografia Matematica. Turin, etc.: G. B. Paravia & Co., [1900]. Size 10×7 , pp. 60. *Diagrams. Presented by the Publishers.*
 The problems dealt with include those relating to the form and size of the Earth, to

phenomena due to the motion of the Earth, and to the calendar. The graphic methods employed, although not presenting the minute accuracy of analytical methods, have the advantage of bringing the factors in the problems vividly before the eyes. A certain amount of spherical trigonometry is, of course, necessary for the solution of some of the problems.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Bio-Geography.

Kirchhoff.

Pflanzen- und Tierverbreitung. Von Alfred Kirchhoff. (Hann, Hochstetter, Pokorny, Allgemeine Erdkunde. Fünfte Auflage von J. Hann, Ed. Brückner und A. Kirchhoff. III. Abteilung.) Wien (etc.): F. Tempsky, 1899. Size $11\frac{1}{2} \times 8$, pp. xii. and 328. *Maps and Illustrations.* Price 9s.

This is the concluding volume of the new edition of the 'Allgemeine Erdkunde,' of which the first volume appeared in 1896. The distribution of plants and animals is clearly dealt with, a preliminary section treating of the general principles of distribution and the relations which exist between the Earth and living organisms. Both as regards fauna and flora, Dr. Kirchhoff divides the world into a somewhat greater number of regions than is done by most writers.

Earthquake Observation.

Van der Stok.

K. A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 244-246.

Two earthquakes, registered in Europe and at Batavia. By Dr. J. P. van der Stok. *With Plate.*

The dates of the earthquakes in question were September 10, and 29-30, 1899.

Geomorphology.

Riv. G. Italiana 7 (1900): 517-528.

Marinelli.

Di alcuni scritti morfologici di Carlo Gemmellaro. Nota di Olinto Marinelli.

Continuation of the study noticed in the *Journal*, vol. xvi. p. 257. Gemmellaro was born in 1787.

Land Forms.

Gordon.

The origin of Land-Forms through Crust-Torsion. By M. M. Ogilvie Gordon, D.Sc., etc. (From the *Geographical Journal* for October, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 14. *Illustrations.*

Limnology.

Forel.

Handbuch der Seenkunde. Allgemeine Limnologie. Von Dr. F. A. Forel. (Bibliothek Geographischer Handbücher. Herausgegeben von Prof. Dr. Friedrich Ratzel.) Stuttgart: J. Engelhorn, 1901 [1900]. Size $8\frac{1}{2} \times 6$, pp. x. and 250. Price 7s.

This is the latest issue of the useful series of geographical handbooks commenced a dozen years ago by the publication of Ratzel's 'Anthropogeographie.' The name of the author is a sufficient guarantee of the excellence of the work.

Meteorology.

C. Rd. 131 (1900): 852-855.

Poincaré.

Emploi de transparents pour combiner les effets de la révolution synodique avec ceux de la rotation terrestre. Note de M. A. Poincaré.

On a practical method of showing the combined effect of lunar and terrestrial motions on meteorological phenomena.

Meteorology—Hail Prevention. *C. Rd.* 131 (1900): 766-769. Gastine and Vermorel.

Sur les projectiles gazeux des canons proposés pour prévenir la formation de la grêle. Note de MM. G. Gastine et V. Vermorel.

Account of experiments to test the behaviour of gases discharged from cannons.

Meteorology—Instruments.

P.R.S. 67 (1900): 3-58.

Chree.

Investigations on Platinum Thermometry at Kew Observatory. By C. Chree, sc.D.

On experiments in platinum thermometry inaugurated at Kew in 1895. Improvements in apparatus, and further experiments, are said to be desirable.

Meteorology—International Meteorological Committee.

Report of the International Meteorological Committee, St. Petersburg, 1899. London: Eyre & Spottiswoode, 1900. Size $10 \times 6\frac{1}{2}$, pp. iv. and 110. Price 2s. *Presented by the Meteorological Office.*

Meteorology—Kite Observations. *Nature* 63 (1900): 109-111.

Frankenfield.

The Kite Work of the United States Weather Bureau. By Dr. H. C. Frankenfield. *With Illustrations.*

Meteorology—Rainfall. *Nature* 63 (1900): 107–109, 128–133. **Lockyer.**

On Solar Changes of Temperature and Variations in Rainfall in the region surrounding the Indian Ocean. By Sir Norman Lockyer, K.C.B., and Dr. W. J. S. Lockyer. *With Diagrams.*

A study of much value in reference to the conditions which influence the recurrence of famine years in India and elsewhere.

Oceanography—North Sea. **Pettersson and Ekman.**

Bihang K. Svensk. Vetens.-A. Handlingar 25 II. (1900): (No. 1) 47.

Redogörelse för de svenska hydrografiska undersökningarne åren 1896–1899. V. Af O. Pettersson och G. Ekman. [Summary in English.] *With Charts.*

Results of recent Swedish research in the North sea and neighbouring waters.

Oceanography—Pacific Ocean. **Lindenkohl.**

Problems of Physiography, concerning Salinity and Temperature of the Pacific Ocean. By A. Lindenkohl. (U.S. Coast and Geodetic Survey Report for 1897–1898. Appendix No. 9, pp. 467–473. *Diagrams.*) Washington, 1899.

Gives results of observations in the Bering and Okhotsk seas.

Oceanography—Salinity Determination. **Pettersson.**

Ann. Hydrographie 28 (1900): 500–504.

Ueber die Salzbestimmung im Meerwasser durch Titrirung. Von O. Pettersson.

Oceanography—Tides. **De Bruyn.**

K.A. Wetens. Amsterdam, P. Section Sci. 2 (1900): 189–196.

On the relation between the mean sea-level and the height of half-tide. By H. E. De Bruyn. *With Diagrams.*

A study of the causes which produce a variation in the difference between mean sea-level (the mean of heights observed at short intervals) and half-tide (the mean of high and low water), with a determination of its range at Delfzyl.

Physical Geography. **Brückner.**

Die feste Erdrinde und ihre Formen. Ein Abriss der allgemeinen Geologie und der Morphologie der Erdoberfläche. Von Eduard Brückner. (Hann. Hochstetter, Pokorny, Allgemeine Erdkunde. Fünfte Auflage von J. Hann, Ed. Brückner und A. Kirchhoff. II. Abteilung.) Wien (etc.): F. Tempsky, 1897. Size $11\frac{1}{2} \times 8$, pp. xii. and 368. *Maps and Illustrations.* Price 7s.

Like the third volume of the same work, noticed above, this has been entirely rewritten by the present author, so as to give a comprehensive view of the general geology and morphology of the Earth's surface in the light of recent research.

Plant-distribution. *J. School G.* 4 (1900): 287–295. **Smith.**

Home Lore: Plant Associations and their Distribution. By Robert Smith, B.Sc.

A very suggestive essay on the proper method of studying plant-life in its varying environments. The importance of vegetation in determining the general aspect of a country and moulding types of scenery is well shown. The premature death of the writer has already been alluded to in the *Journal*.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Historical—Alfred the Great.** **Bowker.**

Alfred the Great, containing Chapters on his Life and Times, by Frederic Harrison, the Lord Bishop of Bristol, Professor Charles Oman, Sir Clements Markham, the Rev. Professor Earle, Sir Frederick Pollock, and the Rev. W. J. Loftie; also containing an Introduction by Sir Walter Besant, and a Poem by the Poet Laureate. Edited, with Preface, by Alfred Bowker. London: A. & C. Black, 1899. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xii. and 260. *Map and Illustrations.* Price 5s.

A series of essays on King Alfred viewed in various characters. That by Sir Clements Markham treats of Alfred as a geographer, and points out the important services rendered by him to geographical science, both in the promotion of intercourse with distant lands, and through his literary labours.

Historical—Almanac. **Marcel.**

Sur un almanack xylographique à l'usage des marins bretons. Par Gabriel Marcel. (Extrait de la *Revue de Géographie*, Numéro d'Octobre.) Paris: C. Delagrave, 1900. Size 10×7 , pp. 16. *Presented by the Author.*

On a wood-engraved almanac of the sixteenth century, containing small marine charts.

Historical—Elizabethan Voyages.**Payne.**

Voyages of the Elizabethan Seamen to America. Select Narratives from the 'Principal Navigations' of Hakluyt. Edited by Edward John Payne, M.A. First Series. Hawkins, Frobisher, Drake. Second Edition (1893, pp. lvi. and 272). Second Series. Gilbert Amadas and Barlow, Cavendish, Raleigh. Second Edition. Oxford: The Clarendon Press, 1900. Size 8 x 5½, pp. l. and 298. *Portraits. Price each vol., 5s. Presented by the Publishers.*

Mr. Payne has done good service in supplying, in a form suitable to general readers, the narratives of the old Elizabethan voyages, as told by contemporary writers. The editorial matter is just sufficient to supply the necessary general grasp of the subject and elucidation of special points, without overweighting the books with extraneous details.

Historical—French Voyages. Ymer 13, 1893 (1900): pp. 430.**Dahlgren.**

De franska sjöfärderna till Söderhavet i början af 18^e seklet. En studie i historisk geografi. Af E. W. Dahlgren. *With Maps.*

An elaborate study of the French voyages to the Pacific in the early part of the eighteenth century, well worthy of a translation.

Historical—Vespucci. B.S.G. de l'Est 21 (1900): 66–87.**Gallois.**

Améric Vespuce et les géographes de Saint-Dié. Par L. Gallois.

On the naming of America by Waldseemüller, and the circumstances which led to it.

History of Cartography. Deutsche G. Blätter 23 (1900): 161–229.**Ruge.**

Der Periplus Nordenskiöld's. Von Prof. Dr. S. Ruge.

A full summary of the chief contents of Nordenskiöld's great work.

History of Cartography.**Wagner.**

Der Ursprung der "Kleinen Seemeile" auf den mittelalterlichen Seekarten der Italiener. Von Hermann Wagner. (Aus den Nachrichten der K. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-historische Klasse. 1900. Heft 3.) Size 9½ x 7, pp. 271–286.

See note, *ante*, p. 80.

BIOGRAPHY.**Abruzzi, Duke of. Deutsche Rundschau G. 23 (1900): 134–137.****Wolkenhauer.**

Prinz Ludwig Amadeus von Savoyen, Herzog der Abruzzen. Ein fürstlicher Nordpolfahrer. Von W. Wolkenhauer. *With Portrait.*

Alcock.**Michie.**

The Englishman in China during the Victorian Era, as illustrated in the Career of Sir Rutherford Alcock, K.C.B., D.C.L., many years Consul and Minister in China and Japan. By Alexander Michie. 2 vols. Edinburgh and London: W. Blackwood & Sons, 1900. Size 9 x 6, pp. (vol. i.) xiv. and 442; (vol. ii.) viii. and 510. *Portraits, Maps, and Illustrations. Price 38s. net. Presented by the Publishers.*

This work is not merely a biography of Sir Rutherford Alcock, although the deceased statesman occupies throughout the central position in the narrative. It acquires a special character from the fact that the writer was himself in great part a personal observer of the occurrences during the period dealt with, and is thus able to present a comprehensive view of the stages by which the present relation between China and foreign nations has been reached. Sir Rutherford's life was so interwoven with the history of the period, that his was the most fitting personality to form the centre round which the events could be grouped. The picture presented is that of a sterling, self-reliant character, characterized above all by devotion to duty and to the interests of his country and humanity at large.

Blanchet. Ann. G. 9 (1900): 456–457.**De la Blache.**

Paul Blanchet. Par P. Vidal de la Blache.

The regretted young French explorer first became known through his researches on the ancient Berber remains in Algeria.

Botella y Hornos. B.S.G. Madrid 42 (1900): 109–126.**Puig y Larras.**

El Excmo. Sr. D. Federico de Botella y de Hornos. Necrologia. Por D. Gabriel Puig y Larras.

Señor de Botella, honorary president of the Madrid Geographical Society from 1891 till his death in 1899, was the author of a large number of works and papers on physical geography.

- Crampel.** *B.S.G. Com. Bordeaux* 26 (1900): 443-445. **Labrousse.**
 Paul Crampel. Par E. Labrousse.
Kingsley. *Deutsche Rundschau G.* 23 (1900): 137-138. _____
 Miss Mary Kingsley. *With Portrait.*

GENERAL.

- Australia and America—Exploration.** *Riv. G. Italiana* 7 (1900): 501-516. **Porena.**
 Le scoperte Geografiche del Secolo xix. del Prof. Filippo Porena. III. Scoperte
 nell' Australia e nelle Americhe.

- Ballooning.** *Globus* 78 (1900): 313-321. **Greim.**
 Wissenschaftliche Luftfahrten. Von Dr. G. Greim. *Illustrations.*

Review of an important German work on the history and results, especially meteorological, of scientific ballooning.

- Book of Reference.** **Trübner**

Minerva. Jahrbuch der Gelehrten Welt. Herausgegeben von Dr. K. Trübner.
 Zehnter Jahrgang, 1900 and 1901. Strassburg: K. J. Trübner, 1901 [1900]. Size
 6½ × 4½, pp. xxviii. and 1286. *Portrait. Price 9s.*

This indispensable work of reference has now reached its tenth yearly issue, which has been made still more complete than its predecessors. The geographically arranged list of learned bodies, whose staffs are given in the body of the work, fills 20 pages.

- Colonization.** *Questions Dipl. et Colon.* 10 (1900): 333-350. **Bernard.**

La main-d'œuvre aux colonies. Par M. A. Bernard.

- Commercial Geography—Coffee.** *Rev. Française* 25 (1900): 598-603. **Vasco.**

Le Café. Par M. G. Vasco. *With Map.*

Historical sketch of the development of coffee-cultivation. The map shows the principal producing countries.

Dock Book.

Dock Book. Fourth Edition, 1900. Containing dimensions of the principal Wet and Dry Docks, Patent Slips, etc., of the World. Also information on Ship Building and Engineering Works in Countries other than the United Kingdom. Compiled from various sources. London: J. D. Potter, 1900. Size 13½ × 8½, pp. 216. *Price 10s. Presented by the Hydrographer, Admiralty.*

French Colonies.**Arnaud and Méray.**

Exposition Universelle de 1900. Les Colonies Françaises. II. Organisation administrative, judiciaire, politique et financière. Par A. Arnaud and H. Méray. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 212. *Price 3s. 9d.*

Guy

_____. III. La mise en valeur de notre Domaine Colonial. Par Camille Guy. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 648. *Price 5s. 8d.*

Froidevaux and Tantet.

_____. IV. L'Œuvre scolaire de la France aux Colonies. Par H. Froidevaux. Survivance de l'esprit français aux Colonies perdues. Par Victor Tantet. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 356. *Price 5s. 8d.*

Imbart de la Tour, Dorvault, and Lecomte.

_____. V. Régime de la Propriété, Régime de la Main-d'œuvre, L'Agri- culture aux Colonies. Par MM. Imbart de la Tour, Dorvault, Lecomte. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 604. *Price 5s. 8d.*

A series of authoritative publications on the French colonies. For purposes of reference there is some drawback in the method of arrangement, the information on any one colony being widely scattered throughout the several volumes. There is, however, some compensation in the comprehensive view presented, in reference to the colonies as a whole, of the separate subjects treated of.

- Geographical Education.** *G. Anzeiger, Petermanns M.* 46 (1900): 130-132. **Haack.**

Hermann Wagners Denkschrift über die Lage des geographischen Unterrichts um die Jahrhundertwende. Von Dr. H. Haack.

- Geographical Education.** *Petermanns M.* 46 (1900): 242-245. _____

Der geographische Unterricht an den deutschen Hochschulen in Wintersemester 1900-1901.

Programme of geographical and allied lectures for thirty-six towns of Germany, Austria, and Switzerland.

Geographical Methods. *G.Z.* 6 (1900): 574-577. **Hettner.**
 Neue Ausserungen über Wesen und Aufgaben der Geographie. Von Alfred Hettner.

A short review of recent contributions on geographical methodology.

Geographical Society of Paris.

Notice sur la Société de Géographie, fondée en 1821, reconnue d'utilité publique en 1827. Paris: Société de Géographie, 1900. Size 9 × 6, pp. 72. *Maps, Plans.*

Geography and Hygiene.

Steiner.

Ueber die Bedeutung geographischer Kenntnisse für das Kriegs-Sanitätswesen. Von Dr. Johann Steiner. (Besonderer Abdruck aus der "Deutschen Militärärztlichen Zeitschrift," 1900.) Size 9½ × 6½, pp. [10]. *Presented by the Author.*

After insisting on the necessity of geographical knowledge on the part of those responsible for the health of troops on a campaign, the writer points out the particular geographical factors of most importance to military hygiene.

Geography of Disease. *Queensland G.J.* 15 (1899-1900): 19-24. **Hirschfeld.**

The Geographical and Climatic Factor in Pulmonary Consumption. By Dr. Eugen Hirschfeld.

Red Sea and Gulf of Aden—Pilot.

The Red Sea and Gulf of Aden Pilot, containing descriptions of the Suez Canal, the Gulfs of Suez and Akaba, the Red Sea and Strait of Bab-el-Mandeb, the Gulf of Aden, with Sokotra and adjacent Islands, and part of the Eastern Coast of Arabia. Fifth Edition, 1900. London: J. D. Potter, 1900. Size 9½ × 6, pp. xxvi. and 520. *Index Charts. Price 3s. 6d. Presented by the Hydrographer.*

The present edition, which supersedes the fourth, published in 1891, has been prepared by Captain John Phillips, R.N.

Science of Geography.

Richter.

Die Grenzen der Geographie. Rede gehalten bei der Inauguration als Rector Magnificus der K. K. Karl-Franzens-Universität in Graz am 4. November 1899. Von Prof. Dr. Eduard Richter. Graz: Lenschner & Lubensky, 1899. Size 10 × 7, pp. 20.

Dr. Richter discusses the relations of geography to geology on the one hand, and history on the other.

NEW MAPS.

By E. A. REEVES, *Map Curator, R.G.S.*

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England and Wales.

Ordnance Survey.

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, since December 8, 1900.

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10; XXXI. 8, 14, 16; XXXII. 9, 11, 16; XXXIII. 13, 14, 15; XXXIV. 5, 11, 14, 15; XXXV. 1; XXXVIII. 12, 15; XXXIX. 1, 2, 9, 13, 14, 16; XL. 1, 2, 3, 4, 5, 6, 9, 11, 12, 15; XLI. 1, 2, 5, 9; XLII. 2, 3, 4; XLIII. 3; XLIV. 11; XLV. 6; XLVI. 4. **Cumberland**, XIV. 4, 7, 8, 10, 11, 14, 15, 16; XV. 5, 16; XVIII. 4, 9, 14, 16; XX. 8, 12, 15; XXI. 3, 4, 7, 8, 9, 10, 11, 12, 13, 14; XXII. 7, 8, 10, 13, 15, 16; XXIII. 13, 14; XXV. 1, 2, 5, 9; XXVIII. 1, 4; XXIX. 4, 5, 6; XXX. 1, 2, 3, 4; XXXI. 2. **Derbyshire**, XLV. 1, 5; XLVI. 10; L. 1, 2, 4, 5, 8; LI. 1, 4, 5, 9, 13; LVI. 7. **Glamorganshire**, VI. 14; XII. 2, 5, 9, 10, 15, 16; XVIII. 1; XIX. 4, 8, 12; XXIX. 5, 13, 15; XXXVII. 8, 8, 12, 16; XLIII. 4; XLIIIa. 9; XLVII. 6; L. 4. **Merionethshire**, XI. 1; XVIII. 4. **Monmouthshire**, XXVII. 5, 13; XXXII. 16; XXXVII. 4; XXXVIII. 9. **Northamptonshire**, VI. 4, 5, 9, 12, 13; VII. 13, 15; X. 10, 13, 14, 15, 16; XL. 4, 6, 9, 13, 14, 15, 16; XII. 1, 3, 12, 13, 14, 15, 16; XIII. 3, 7, 10, 13, 14; XV. 8, 13, 16; XVI. 1, 5, 6, 15; XVII. 1, 3, 4, 6, 8, 10, 11, 14; XVIII. 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16; XIX. 1, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15; XX. 5, 9; XXIV. 4; XXV. 7, 10, 11, 14; XXVI. 4, 13, 15; XXVII. 3, 4, 11; XXXII. 7; XXXIII. 11; XXXIV. 1; XLIV. 4. **Nottinghamshire**, XXXII. 12; XXXVII. 4, 8, 10, 11, 15; XXXVIII. 5, 16; XXXIX. 9; XLI. 4, 7, 8, 11, 14, 15; XLIII. 5; XLV. 7; XLVI. 3, 4. **Wiltshire**, XV. 8; XX. 14; XXVI. 13; XXXIII. 14, 15, 16; XXXIV. 10, 13, 14; XXXV. 13; XXXIX. 10; XL. 2, 12, 13, 16; XLI. 2, 4, 5, 6, 13, 14, 15; XLV. 7, 8, 12, 15; XLVI. 3, 4, 7, 8, 9, 10, 11, 13, 14; XLVII. 1, 2, 3, 6, 7, 10, 11, 12, 16; XLVIII. 2, 9, 10, 11, 15, 16; LII. 2, 7, 11; LIII. 1, 3, 10. *3s. each.*

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Germany.

Konigl. Preuss. Landes-Aufnahme.

Karte des Deutschen Reiches. Scale 1: 100,000 or 1·6 stat. mile to an inch. Sheets: 231, Haren; 256, Lingen; 282, Rheine; 311, Hildesheim; 358, Brakel. Herausgegeben von der Kartogr. Abtheilung der Konigl. Preuss. Landes-Aufnahme. *Price 1.50 mark each sheet.*

Sweden.

Swedish General Staff.

Generalstabens Karta öfver Sverige. Scale 1: 100,000 or 1·6 stat. mile to an inch. Sheets: 79, Eda; 97, Falun; 98, Gefle.—Karta öfver Norrbottens Län. Scale 1: 200,000 or 3·2 stat. miles to an inch. Sheets: 39, Jädnem; 40, Dikanäs; 44, Piteä; 48, Vilhelmina. Generalstabens topografiska afdelning, Stockholm. *Presented by the Topographical Section of the Swedish General Staff.*

ASIA.

Central Asia.

Sven Hedin.

Karte des Tarim-Beckens und des Kwen-lun-Gebirgssystems. Hauptsächlich nach den Forschungen von Dr. Sven Hedin in den Jahren 1894–96 und mit Benutzung aller vorhandenen Quellen entworfen und gezeichnet von Dr. Br. Hassenstein. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Nebenkarten: Bl. i. Route von Kok-Rabat über Jarkent nach Kargalik, 1: 500,000 or 7·8 stat. miles to an inch. Die Oasen des Masar-tag, 1: 500,000. Die Oase Khotan, nach Dutreuil de Rhins, 1: 500,000. Bl. ii. Die Oase Kerija, 1: 500,000. Bl. iii. Reiseroute von Kum-tjekke nach dem Lop-nor, 1: 750,000 or 10·2 stat. miles to an inch, Taf. 1–3.—Karte des mittleren und östlichen Kwen-lun zur Darstellung von Dr. Sven Hedins Routenaufnahmen im Hochland des nördlichen Tibet, Tsajdam und dem Kuku-nor-Gebiet 1896 und 1897 bearbeitet und gezeichnet von Dr. Br. Hassenstein. Scale 1: 1,000,000 or 15·8 stat. miles to an inch, Taf. 4–5.—Dr. Sven Hedins Reiseroute durch Kan-su, Ala-schan und Ordos, 1896 und 1897. Nach dem Tagebuch entworfen und gezeichnet von Dr. Br. Hassenstein, 1: 1,000,000. Nebenkarte: Uebersicht von Dr. Sven Hedins Reiseroute von Kuku-nor bis Peking, 12. November 1896 bis 2. März 1897, 1: 7,500,000 or 118 stat. miles to an inch, Taf. 6. Petermanns Geographische Mitteilungen. Ergänzungsheft No. 131. Gotha: J. Perthes, 1900. *Presented by the Publishers.*

These six sheets of maps accompany the scientific report on Dr. Sven Hedin's explorations in Central Asia between the years 1894 and 1897. They have been compiled by Dr. B. Hassenstein from the explorer's notebooks and surveys, combined with the work of other travellers, a list of whom is given, together with the dates of their journeys. It is to be regretted that the results of Captain H. H. P. Deasy's surveys in the region of the upper Yarkand valley could not be utilized, but the map showing these did not appear until just after Dr. Sven Hedin's maps were published. Dr. Sven Hedin has added considerably to our knowledge of the geography of Central Asia, and these maps, and the text they accompany, testify to his perseverance, industry, and skill.

China.**Anz.**

Routenaufnahme zwischen Tschifu und Kiautschou. Ausgeführt im März 1899 und gezeichnet von Walther Anz. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Petermanns Geographische Mitteilungen Jahrgang 1900, Taf. 23. Gotha : J. Perthes, 1900. *Presented by the Publishers.*

Indian Government Surveys.**Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets : 77 N.E., parts of districts Nellore and Kadapa (Madras Presidency), 1899; 44, parts of districts Malabar and South Kanara (Madras) and of Coorg, 1899.—Upper Burma Survey, 1 inch to a mile. Sheets : 175 (preliminary edition), district Minbu, Seasons 1892-93, 1900. 304 (preliminary edition), part of Ruby Mines district and Northern Shan States, Seasons 1890-93 and 1896-97. 1899. 402 (preliminary edition), Southern Shan States, Season 1897-98. 1899. 405, Southern Shan States, Season 1897-98. 1900. 406 (preliminary edition), Southern Shan States, Season 1897-98. 1900.—Bombay Survey, 1 inch to a mile. Sheets : 164, district Thana, Season 1880-81. 1900. 206, parts of Ratnagiri district and Kolhapur and Bavda States, Season 1892-93, 1900.—Central India and Rajputana Survey, 1 inch to a mile. Sheets : 274, parts of Gwalior, Indore, and Dewas (C.I. Agency), Season 1877-78. 1900. 282, parts of districts Khândesh (Bombay Presidency), Nimar (Central Provinces), and Native State of Holkar (C.I. Agency), Season 1874-75. 1900.—Sind Survey, 1 inch to a mile. Sheets : 47, district Hyderabad, Seasons 1893-94 and 1896-97. 1900.—68, districts Hyderabad and Thar and Parkar, Seasons 1893-94 and 1897-98. 1900.—India, to illustrate Gauges of Railways, 80 miles to an inch, 1900.—Assam, index map showing scales of survey. 1900.—Assam, index map showing scales of publication. 1900.—District Jhelum, Punjab, 8 miles to an inch. 1900.—Map of portions of Western China and Tibet, explored by Captain H. H. P. Deasy in 1897-98-99, 8 miles to an inch, 5 sheets.—Alwar State, Rajputana. 1900.—Nos. 6 and 7, preliminary Charts of the Principal Triangulation of the Manipur Longitudinal Series, Seasons 1894-96 and 1898-99. 4 miles to an inch. 1900. *Presented by H.M. Secretary of State for India, through the India Office.*

Manchuria.**‘Pravitelstvenny Vestnik.’**

Map of Manchuria, showing railways, telegraph lines, etc. Scale 1 : 3,275,712 or 51·7 stat. miles to an inch. Issued with the ‘Pravitelstvenny Vestnik.’ St. Petersburg : A. Ilyin.

A rough outline map of Manchuria, in Russian, prepared specially to show means of communication, including railways constructed and proposed, and telegraph lines. It is issued with the ‘Pravitelstvenny Vestnik,’ an official publication.

AFRICA.**Congo Free State.****Wauters.**

Carte de l'État Indépendant du Congo. Scale 1 : 2,000,000 or 31·4 stat. miles to an inch. Dressée par A. J. Wauters, Rédacteur en chef du ‘Mouvement Géographique.’ L. Monduau, Bruxelles, 1900. 4 sheets. *Presented by the Author.*

This is a new edition of M. Wauters' map of the Congo Free State and parts of adjacent territories, which was first published in sections in the *Mouvement Géographique* in 1897 and 1898. Although the map is corrected to October, 1900, in some respects it is not quite up to date, as since then the results of several important expeditions have been made known; but these will doubtless be embodied in another edition. It is printed in colours, and a great deal of information is given.

German East Africa.**Sprigade.**

Karte von Deutsch-Ostafrika. Scale 1 : 300,000 or 2·7 stat. miles to an inch. Sheet x6, Mohoro. Von P. Sprigade. Berlin : D. Reimer (Ernst Vohsen), 1900.

The alteration in the style of production of this map, as exemplified by the present sheet, does not appear to be an improvement. Hitherto the system of horizontal lines representing the relief has been combined with brown shading, but now line-work only is employed, which in some places is not very distinct, whilst the lettering in certain instances is smaller and somewhat lacking in clearness. Travellers' routes are shown together with the dates of their journeys, and notes are given descriptive of the character of the country.

Morocco.**Fischer.**

Reisewege im Atlas-Vorlande von Marokko. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Aufgenommen und gezeichnet von Professor Dr. Theobald Fischer

in Frühjahr 1899. Petermann's 'Geographische Mitteilungen.' *Erganzungsheft*, No. 133, Taf. 2, 3 u. 4. Gotha: J. Perthes, 1900. *Presented by the Publishers.*

Dr. Fischer's route, laid down on these three sheets, extends from Mogador, eastward to the city of Morocco, and thence northward to Casablanca; after this it again turns inland, and passes in an easterly direction to Fez. Altitudes are given, together with notes descriptive of the character of the country traversed. The map accompanies a scientific report on the expedition, which, among other information, gives an account of the manner in which the route survey was conducted.

North-East Africa.

Michel and Hansen.

Mission de Bonchamps de Djibuti au Nil Blanc à travers l'Éthiopie Méridionale et les Pays Gallas. Scale 1: 200,000 or 3.1 stat. miles to an inch. D'après les travaux de MM. L. Bartholin, Ch. Michel, Faivre et M. Potter. Dressé par Ch. Michel, second de la Mission 1897-98. Dessiné par J. Hansen. Service Géographique des Colonies. Paris: Henry Barrère. 15 sheets. *Price 20 francs. Presented by M. Ch. Michel.*

The results of the explorations and surveys of the members of the Bonchamps Expedition, from Jibuti on the Red sea, through Southern Abyssinia to the Sobat and Nile, are shown on this map, which consists altogether of fourteen sheets and an index folded in a portfolio. The scale of the map is 1: 200,000, or just over 3 stat. miles to an inch, which is sufficiently large to admit of a considerable amount of detail being shown; and although little attempt has been made to incorporate the work of other explorers, and a few miles from the line of route the map is a blank, yet near the line traversed by the expedition a good deal of information is given, including altitudes and notes on the character of the country. No description appears on the map of the manner in which the survey was made, the instruments employed, the relative value of certain parts of the work, the reliance to be placed upon the positions assigned to various places, nor how the altitudes have been obtained, which is to be regretted. It, however, appears to be in the main an ordinary route-survey, adjusted to certain astronomically determined positions, that for Addis Abeba agreeing in latitude and longitude with the results of observations made by Captain Germain and Sub-Lieut. Dyé, of Commandant Marchand's expedition in 1899.

Although somewhat roughly lithographed, the style of the work is fairly clear. No colouring has been employed, and the hill-work is shown by black horizontal lines.

West Africa.

Wallach.

Map of the Gold Coast, with part of Ashanti, showing the positions and areas of mining properties. By Henry Wallach, F.R.G.S. Scale 1: 253,440 or 4 stat. miles to an inch. London: E. Stanford, 1900. 4 sheets. *Price £1 1s. Presented by the Author.*

This map extends from 7° N. lat. to the coast, and from long. 0° 30' E. to 3° 10' W. It has been especially constructed by Mr. Wallach to show the positions and areas of mining properties, which are named and tinted red; but, in addition to this, the map will be useful for general reference, as it contains a good deal of useful information, and shows divisional boundaries, railways, and telegraphs. The lower course of the Volta to the sea is given as an inset on the same scale as the principal map.

GENERAL.

World.

Schrader.

L'Année Cartographique. Supplément annuel à toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Dixième Supplément. Contenant les Modifications Géographiques et Politiques de l'Année 1899. Trois feuilles de cartes avec texte explicatif au dos. Paris: Librairie Hachette et Cie., 1901. *Price 3 fr.*

Although the title on the cover of this tenth issue of the 'Année Cartographique' states that it contains "les modifications géographiques et politiques de l'année 1899," this is misleading, for in the present case M. Schrader has devoted his publication to a very interesting review of the geographical work of the world during the nineteenth century. On three sheets he gives two maps of the continents, on the same scale and facing each other, upon which he shows, by a system of brown tinting, the state of our geographical knowledge at the commencement and close of the century. The extent of our information concerning various regions is indicated by the intensity of the colouring, the darkest representing parts that have been thoroughly surveyed, a lighter shade those regions that are approximately mapped, a somewhat lighter shade still those parts concerning which only rough route-surveys exist, whilst regions that are totally unexplored are left white. By comparing the two maps of any continent, the

progress made in discovery and exploration during the century is in this way clearly brought out; although perhaps a more graphic and natural effect would have been produced by reversing the order of the shades, and showing regions concerning which we have the best information as white, and those of which we are still in ignorance as dark. There are altogether three sheets, of which the first deals with Asia and Australia, the second with Africa, and the third with North and South America. The maps, although of a very general character, have been carefully prepared, and contain on their backs notes giving a summary of the principal explorations and surveys of the century.

World. Vivien de St. Martin and Schrader.
Atlas Universel de Géographie. Commencé par M. Vivien de St. Martin et continué par Fr. Schrader. Sheet 44, Asie politique. Paris: Librairie Hachette et Cie. *Price 2 fr. Presented by the Publishers.*

Like all others belonging to this atlas, this general political map of Asia has been most carefully drawn and engraved. It shows a deal of information for a map on so small a scale, and yet has not the appearance of being overcrowded. Political boundaries are indicated in colour.

United States Charts. U.S. Hydrographic Office.
Pilot Charts of the North Atlantic Ocean for December, 1900, and of the North Pacific Ocean for January, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

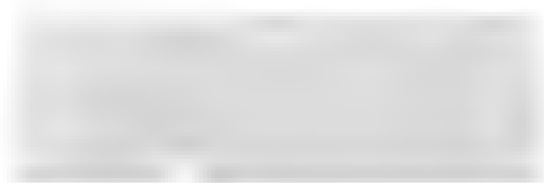
1-inch Scale.

	Price per sheet.
1. England and Wales, old series, in black, with outline and hill hachures.	
Size 36 × 24	2 6
Size 18 × 12	1 0
2. Ditto, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
3.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
4.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
5.*Ditto, hills hachured in brown, contours red, roads brown, water blue, magnetic variation shown, latitude and longitude not marked. Size	

* Publication in progress.

	Price per sheet.
18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1 0
Combined sheets	1 6
6. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1 9
7.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1 6
8. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
9. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
10.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted 9d. to	1 0
Folded in cover 1s. to	1 6
4 Miles to an Inch.	
11.*England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1 6
12.*County maps, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. Kent, size 22½ × 17 inches. Northumberland and Durham (combined), size 17½ × 23½ inches. In sheets, unmounted	0 6
Folded in covers	0 9
6-Inch Scale.	
13. Great Britain, water coloured blue or black lined, contours in black, latitude and longitude marked. Heliozincographed and photozincographed. Size 18 × 12 inches .	1 0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6
1/1500 Scale.	
15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2s. 6d. to 23s., according to the amount of colouring. This form is gradually being superseded by 15.	
Town Scales.	
17. 1/2500 scale, houses stippled. Size 38 × 25½	2 6
18. Ditto, houses ruled. Size 38 × 25½	2 6
19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2s. 6d. to 15s., according to the amount of colouring. Applies to unrevised only.	
20. 5-foot scale, houses stippled. Revised. Size 36 × 24 inches	2 6
Index Maps.	
21. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0 2
22.*Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
23.*Index to the sheets of the 1 : 2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.	

* Publication in progress.





HER LATE MAJESTY QUEEN VICTORIA,
EMPRESS OF INDIA.
Patron of the Royal Geographical Society.

(From the Portrait by J. Thomson.)



The Geographical Journal.

No. 3.

MARCH, 1901.

VOL. XVII.

IN COMMEMORATION OF THE REIGN OF HER LATE MAJESTY, QUEEN VICTORIA, EMPRESS OF INDIA.*

I. PRESIDENT'S ADDRESS IN COMMEMORATION OF HER LATE MAJESTY.

OUR late beloved Queen was the Patron of this Society for sixty-three years, and the generous and enlightened bestower of the royal awards through the hands of the Presidents and Councils for the same period. We have, therefore, felt it to be our duty to devote an evening to the commemoration of Her Majesty's reign from the point of view of our science.

In common with the rest of the late Queen's subjects in all parts of the world, we geographers have felt admiration for the rare and lofty gifts of the greatest and best of our sovereigns; we have felt love and devotion for the gracious lady who, with unfailing warmth of heart, has shared with closest sympathy the sorrows and anxieties of her people. We have been grateful to the able and sagacious ruler who, through her long reign, bore the heavy burden of the affairs of a great empire in spite of her own heavy trials, and of the increasing weight of years. We fully shared in the deep and reverential grief of the rest of her subjects when the news of her death cast a shadow of gloom on her vast empire.

The end of that precious life brought most vividly before us all the

* Meeting of the Royal Geographical Society, February 11, 1901.
No. III.—MARCH, 1901.]

glories of the longest reign in history. Not counting their minorities, Harald "the fair-haired" of Norway, and Louis XIV. of France, reigned for as many years, but not actually so long. Jayme I. of Aragon reigned as long, but including his minority. Our beloved Queen was spared for all these years for the good of her people, for we know now how great a share Her Majesty's personal character, her influence wisely used, her experience and knowledge, had in that marvellous advancement which has signalized the last sixty years. Queen Victoria has been part of the lives of her subjects from the earliest time to which their memories go back. Very few can remember any other sovereign in this country. I am one of the few. As a very little boy I well remember seeing the Princess Victoria on what must have been nearly her first public appearance. In August, 1836, when I was six years old, there was a grand dinner in St. George's Hall at Windsor, and I was in the gallery through the kindness of Sir Herbert Taylor, an original Fellow of this Society. My gaze was riveted to the dazzling masses of gold plate on the long table, until the sound of music made me raise my eyes. Then I saw the old King leading the fair young Princess up the room.

But even before that event, which has left such a deep impression on my mind, and long before her accession, the young Princess Victoria took an interest in geography and in exploration. Let us fancy ourselves in a room in Kensington Palace in the winter of 1833. There is the Duchess of Kent with the young Princess Victoria, then in her fourteenth year. Maps are spread out before them, and the Secretary of the Geographical Society is in attendance. With him are two great arctic explorers, Captains Beechey and Back. They are there to explain to the young Princess the geography of the region in which the Rosses were lost, and the route Captain Back intended to take in searching for them; and the Princess Victoria took a lively interest in following the intended track on the chart. Nor did her interest end with the interview. When her mother subscribed £100 towards the expenses of the expedition, the young Princess sent Captain Back a present of a case of mathematical instruments and a pocket-compass as her contribution to the equipment.

It turned out that this delicate little pocket-compass, the gift of the Princess Victoria, proved to be extremely useful. In the estuary of the Fish river, when there was great disagreement in the other needles in denoting magnetic north, that of the Princess could alone be relied upon; it almost seemed like an emblem or forecast of the excellent steadfastness to duty of our great Queen, "true as the needle to the pole."

With these and other memories of the interest the young Princess had taken in our labours, our Council hailed, with heartfelt congratulations, the accession of Queen Victoria. In almost prophetic words,

our Council * expressed an earnest hope that “ Her Majesty’s reign would be famed for its glory and prosperity, and for the promotion of geographical knowledge ; that it might be rendered illustrious as the era of important discoveries which may diffuse the blessings of civilization throughout the globe, as well as endeared to the affections of a free and grateful people.” We all know how fully and completely the hope expressed in those prophetic words has been realized.

One of the first acts of Her Majesty’s reign was to intimate her gracious intention to succeed her uncle, our Founder, as Patron of the Society, and to bestow upon us her royal premium for the encouragement of geographical science and discovery. Since Her Majesty’s accession this royal premium has taken the form of two gold medals granted annually—the Founder’s Medal and the Patron’s Medal. If, as we trust, His present Majesty should be pleased to succeed to the patronage of the Society and to continue the grant of the royal premium, there will still be the Founder’s Medal and the Patron’s Medal. But it has been suggested that, in memory of our beloved Queen, there should continue to be a Victorian Medal, once the Patron’s Medal, not to be given annually, but only occasionally, for geographical research.

The royal premium has been one great incentive to geographical discovery, for to win it is to win the blue ribbon of our science, and to be enrolled among men whose names will live in history. The seven first to receive it, in the Queen’s reign, were Simpson, who completed the discovery of the northern coast of America ; Sir Henry Rawlinson, our lamented President ; Sir Robert Schomburgk, the value of whose surveys in Guiana were proved in the course of the recent arbitration ;

* *Patron.*

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Vice-Patron.

THE DUKE OF SUSSEX.

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Lieut. Raper, author of the best work on practical astronomy; Lieut. Wood, the discoverer of the source of the Oxus; Sir James Ross, the great antarctic discoverer; and Governor Eyre, the Australian explorer, who is the father of our Medallists, and who still survives in a green old age. To several of our Medallists Her late Majesty graciously added other marks of her approval, specially for their geographical labours.

Our own diploma, given to students in practical astronomy and surveying, has certainly been welcomed by more than one department of Her late Majesty's Government, and has thus tended to carry out the Queen's wishes, expressed when she granted the royal premium, that geographical aspirations should be encouraged. We have instructed students in several professions and engaged in numerous occupations. The success of our scheme is proved by the number of royal and other awards won by our students, with the present Viceroy of India foremost in their front rank. But the majority have been officers in the army, and we may have the satisfaction of feeling that our efforts were made in the direction approved and desired by our beloved sovereign, for they are efforts to advance the efficiency of the "Soldiers of the Queen."

A review of the progress of geography during the late Queen's reign is a record of the fulfilment of the prophetic words of our Council in 1837; and on all appropriate occasions Her Majesty showed the deep interest she always took in that progress in all parts of the world. Such an occasion, among others, was found when Captain Speke returned from the discovery of the Victoria Nyanza in 1863. When our President, Sir Roderick Murchison, waited upon the Queen as one of the Royal Commissioners of the International Exhibition, Her Majesty congratulated him most graciously upon Captain Speke's great geographical feat, and, from the kind and emphatic manner in which the Queen expressed herself, Sir Roderick felt that she was truly proud in the reflection that two of her own gallant officers had succeeded in doing what the people of every other European nation had failed to accomplish. Captain Speke's premature death prevented his receiving a special mark of his sovereign's approbation; but her Majesty conferred honours upon his companion, and on Sir Samuel Baker who relieved them, for their geographical services.

I now propose to pass very briefly in review the progress of polar discovery during the Queen's reign, while the glorious record as regards other parts of the world will be in abler hands.

POLAR EXPLORATION DURING THE REIGN.

The first great polar achievement of the late reign was the discovery of Victoria Land by the Antarctic Expedition under the command of Sir James Ross, the most experienced of polar navigators. It was a memorable voyage, or rather series of voyages, and all its details are now receiving very close attention with reference to our forthcoming

expedition. The Queen conferred the honour of knighthood on the gallant and accomplished commander, and attention was then turned to the arctic regions, a part of the world in which Her Majesty had shown such special interest before her accession. Sir John Franklin's expedition sailed in the eighth year of the Queen's reign.

We no longer look upon the devoted zeal, the high-souled courage, and the heroic deaths of Sir John Franklin and his gallant companions as embodying one of the disasters of the Queen's reign. Those heroes are now among the *Dii majores* of explorers. They set examples which we hold up for imitation; their deeds invite successive generations to go forth and do likewise. Their expedition forms a turning-point in the history of exploration. They made the most remarkable arctic voyage on record, and discovered the north-west passage.

Then followed the search expeditions from 1848 to 1854, during which time many thousands of miles of coast-line were discovered through the zealous and persevering work of sledge travellers, working on the system developed and perfected by Sir Leopold McClintock. An immense addition was thus made to our knowledge. It is only necessary to compare the maps of the arctic regions of 1837 and 1857 to be convinced that a very great and important work of discovery was achieved by the officers of Her Majesty's navy in the interval. The period closed with a memorable event.

The *Resolute* was abandoned in $74^{\circ} 41' \text{ N.}$ and $101^{\circ} 17' \text{ W.}$ She drifted out of the ice, and was picked up by an American vessel 20 miles from Cape Mercy, in September, 1855. The Congress of the United States purchased this old discovery ship of Her Majesty, and resolved to repair and fit her out, in order to restore her as an offering of good will to the Queen. The *Resolute* reached Spithead in December, 1856, under the command of Captain Hartstein, U.S.N. Then Her Majesty the Queen, with Prince Albert, the two eldest princesses, and his present Majesty went on board the *Resolute*, and were received by Captain Hartstein. He informed Her Majesty that the vessel was restored by the President and people of the United States as a token of love, admiration, and respect for herself personally. As twelve years previously we saw the young Princess Victoria examining the routes about to be taken by Captain Back on an arctic chart, so now we find Her Majesty Queen Victoria, in the cabin of the *Resolute*, looking over the chart with Captain Hartstein, who traced for Her Majesty the drift of her exploring ship, and pointed out the discoveries of Dr. Kane, then quite recent. The Queen had not lost the lively interest taken by the Princess Victoria in arctic discovery.

But the search for Franklin was not yet completed. McClintock sailed in the *Fox* in the spring of 1857, and it remained for our illustrious Vice-President to weave together the story of a glorious achievement, and to secure for the memories of Sir John Franklin and

his followers the honours for which they died. We must not forget to mention, in connection with the voyage of the *Fox*, the name of Allen Young, whose remarkable journey effected the completion of the discovery of Prince of Wales island, whose generous and single-minded zeal led him not only to give his services gratuitously, but also to subscribe largely to the funds of the expedition, and whose subsequent valuable services in the two voyages of the *Pandora* were recognized by the Queen with a companionship of the Bath and a knighthood. All the excellent work done by Sir Allen Young was done at his own expense, influenced solely by single-minded zeal for a great cause and for the service of his Queen and country.

A period of fifteen years elapsed which were barren of polar progress, but when at last the Government once more resolved to despatch an Arctic Expedition in 1875, Her Majesty showed the interest she always took in polar discovery by granting an interview to Captain Nares, Captain Stephenson, and Commander Markham at Osborne. From a scientific point of view, the expedition of Sir George Nares was by far the most successful British Arctic Expedition during Her Majesty's reign. I, at least, have a right to say that its discoveries completed evidence which pointed to the true solution of the secrets of the Arctic Regions. Dr. Nansen's memorable expedition confirmed all the conclusions which were to be derived from previous knowledge, including the final and completing labours of the Nares Expedition.

The reign of Queen Elizabeth was as much signalized by the munificent generosity of her merchant princes in promoting geographical exploration, as by the actual discoveries of her gallant sailors. The names of Sir Thomas Smith, the founder of the East India Company, of Sir Thomas Roe, the great ambassador, of Sir Dudley Digges, of Sir John Wolstenholme occur to comparative geographers at once; those of Sanderson, too, and of Sir George Barne, whose gallant young descendant is about to join our National Antarctic Expedition.

But in this respect also the reign of Victoria emulates that of her renowned predecessor. Felix Booth equipped, at his own expense, the expedition of the *Rosses*, in the rescue of which her late Majesty took so deep an interest. It was under the auspices and at the expense of Charles Enderby that important discoveries were made in the Antarctic Regions. More recently, Mr. Leigh Smith, at his own expense, explored the coasts of Spitsbergen and Franz Josef Land; and we all remember how Mr. Alfred Harmsworth, entirely at his own expense, sent a well-equipped expedition to Franz Josef Land. It is due to him that the western half of that group was discovered by Mr. Jackson, ably and loyally assisted by Mr. Armitage, who, full of single-minded zeal, now goes out as second in command of our Antarctic Expedition. Nor must we omit the admiration due to the generous zeal of Sir George Newnes in despatching an expedition, under Mr. Borchgrevink,

to Victoria Land at his own expense. Mr. Borchgrevink was the first to put foot on Victoria Land, and he planted the British flag at the furthest south.

But foremost in this respect stands the name of Mr. L. W. Longstaff, whose act of unselfish and patriotic liberality does indeed remind us of the merchant princes of the days of old. The subscription of this old and valued Fellow of the Society put an end to doubts, and made our Antarctic Expedition a certainty. Mr. Longstaff's words, simple as they seem, are full of the fine spirit of chivalrous patriotism. "Being convinced," he says, "of the imperative need of the preparation of a British expedition, I have the pleasure to inform you that I have this day paid a sum to the credit of the Antarctic fund which I trust will meet the exigency of the case. As a Fellow of our Society for thirty years it gives me peculiar pleasure to be able thus to contribute towards the advancement of a knowledge of the planet on which we live."

The words are simple, but the deed is a great deed, placing the reign of Victoria quite on a par with that of Elizabeth as regards the munificence of the promoters of geographical discovery. Whence does this fine spirit of zealous patriotism flow, seen alike among those who encourage and promote, and among those who go forth for deeds of derring do? Can we doubt that no small part of the incentive to that devotion to duty which we see around us is due to the feelings of intense loyalty aroused and maintained by the example of our beloved Queen now passed away? Her memory will ever be fresh and green among us, because we shall constantly be reminded of the most perfect pattern that was ever set before a nation. I will conclude this poor and inadequate tribute by mentioning that the very last message to her Society, from our august Patron, was an expression of good wishes for the success of our Antarctic Expedition.

I will now call upon our Vice-President, Sir George Goldie, to review the progress of discovery and the expansion of empire during the reign of Queen Victoria, in America, Africa, and Australasia.

II. PROGRESS OF EXPLORATION AND THE SPREAD AND CONSOLIDATION OF THE EMPIRE IN AMERICA, AUSTRALIA, AND AFRICA.

By the Right Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G.

The part allotted to me this evening calls for the utmost exercise of your indulgence, for it is the survey, in thirty minutes or thereabouts, of the work effected during the last sixty-four years in the exploration, spread, and consolidation of the British Empire in an area of about ten million square miles, or about eighty times the area of the British Isles—a work to which I could only do justice in a long course of lectures. To-night a rough sketch, indicating salient

features, is alone possible; and if what artists call "the distribution of values" appears faulty, you will bear in mind that our special concern here is to regard matters from the geographical point of view.

In this survey the Dominion of Canada takes precedence, and the subject is peculiarly appropriate at this Commemorative Meeting, because the modern political history of "Our Lady of the Snows" dates from the first year of the Victorian age. It was within twelve months of Her Majesty's accession that Lord Durham landed at Quebec, as "Governor-General of all British provinces within and adjacent to the continent of North America." His famous mission resulted in the adoption (in 1840) of a rational principle of colonial policy—that principle of self-government which, a century earlier, might have saved to the Empire the great regions lying between Canada and the Gulf of Mexico. Lord Durham was a man of remarkable prescience. At a time when most other English great landowners still looked askance at railways, he recommended an intercolonial railway, as a means of bringing the Canadian provinces into line. With what pleasure would he have seen the great results already realized by the completion of that splendid enterprise, the Canadian-Pacific railway!

But Lord Durham also foresaw the development that would result from the granting of free institutions. Referring to this question of expansion in his report of 1839, he said, "The constitution of the form of government, the regulation of foreign relations and of trade with the mother country and foreign nations, are the only points on which the mother country requires a control. The privileges, carried to their logical conclusion, of representative government will do the rest." Certainly, under the old *régime* the two main instruments of the exploration and settlement of the vast area of the Dominion would have been wanting. The first of these was the creation of the Geological Survey of Canada, which under that modest title has carried its work over immense regions, and covered much more than the field of geology. Geography, botany, zoology, ethnology, and other branches of knowledge have alike shared in the benefits of this fine organization. Proposals for such a survey for Upper Canada had been pressed from 1832 onwards; but it was not until the concession of self-government that the project was carried into effect, in 1842, by the Provincial Government of the two Canadas, and Sir William Logan was appointed to organize and direct it. Logan resigned in 1869, and was succeeded by Dr. Alfred Selwyn, who held office until 1895, when he was succeeded by Dr. G. M. Dawson, whose earlier personal explorations in the Rocky mountains had made his name familiar to us on this side of the Atlantic. After the Federation of 1867, the Geological Survey extended its operations gradually across the continent to the shores of the Pacific. Although the scientific exploration of the Dominion, during the late reign, has been largely the work of the Geological Survey, we must not lose sight of the

important and independent work of the Topographical Survey, while it would be unjust to overlook the valuable part played by the Hudson Bay Company in its huge territory between 1837 and 1870, when it handed over its powers as a government. Nor must I omit to mention Captain Palliser's important expedition of 1857-58 (in and about the Rocky mountains), undertaken at the instance of this Society, which also awarded him its Gold Medal.

But scientific exploration could not have been consistently maintained, nor could it have served much practical purpose, if there had not been an army of hardy and energetic settlers behind it—and, at a later date, a mining population—ready to press into the newly opened regions; and it is beyond doubt that this development would not have taken place but for the combination of free local institutions with unity of central government which the Dominion of Canada enjoys.

At the commencement of the last reign the white population was 1,335,000; last year it was estimated at five and a quarter millions. I shall not give statistics of trade in 1837-38, because of the extraordinary discrepancies that exist between the two highest authorities of those days, Montgomery Martin and Herman Merivale, and there is no time to-night to try and reconcile their differences. But, in any case, the volume of trade then was insignificant compared with the 33 million pounds of exports and 28 million pounds of imports which the Dominion now shows.

There is no occasion to refer to our other possessions in the Western world, beyond mentioning the valuable geographical work of Sir Robert Schomburgk in British Guiana early in the last reign, and that of Mr. Im Thurn and others more recently.

The expansion of Australia during the Victorian period demands more detailed notice than that of Canada, because the southern continent had not a long antecedent history of exploration and settlement. It is very difficult to realize that the foundation of Melbourne was contemporaneous with the accession of Her Majesty, the earliest settlements in Victoria having only been formed in 1835; that the first settlers of the famous Wakefield Company only sailed from England in 1836 for South Australia, where Governor Hindmarsh, under a tree near the beach, read his commission to a small audience of emigrants and officials; that the then recently established Swan River Settlement (which afterwards became the colony of West Australia) was, in 1837, little superior to the settlement of Eden, as described by Dickens in 'Martin Chuzzlewit'; that Queensland was known only by its penal establishment at Moreton bay; that Tasmania, though somewhat better known and populated, owing to its insular formation, was in its infancy; and, finally, that New South Wales, our premier Australian colony, was, in 1837, still practically confined to the narrow strip lying between the ocean and the watershed of that mountain range which follows the

whole eastern coast and part of the southern coast of the continent. To compare the condition of Australia in 1900 with that in 1837, brings forcibly home to our minds both the unprecedented duration of the last reign and the rapidity with which our race can develop the resources of a new country when in possession of their greatest heritage—free institutions. But this advance of settlement had to be preceded by exploration; and the story of this in Australia derives a special interest from the terrible hardships often endured owing to the nature of the interior of the continent. During the eighteen years before Her Majesty's accession, some valuable expeditions—but all confined to the south-east corner of the continent—had been made by Oxley, Mitchell, Hume, Cunningham, and Sturt, the last of whom, through his later and greater work, earned the name of "the father of Australian exploration." But about the commencement of the Victorian age, a new impulse was given to the opening up of the continent by the fact that the southern and western coasts at last possessed settlements, so that the interior was attacked from three sides instead of from the east coast alone. Time permits only a brief reference to a few leading names out of a great number of explorers. In 1837 and 1839, Captain Grey, afterwards governor of South Australia, explored a portion of West Australia and claimed the discovery of ten rivers. E. J. Eyre, after preliminary inland travels in 1838 and 1839, made his famous march round the Great Bight, suffering terrible privations. In 1844–45, Sturt led the first Great Central Desert expedition to the very heart of the continent. At the same time, Mitchell completed his fame as an explorer by his Barcoo expedition; and Leichhardt travelled from the Darling Downs to the Gulf of Carpentaria. His subsequent journey in 1848, in which his entire party, including five other white men, disappeared for ever, is notable for the valuable search expeditions to which it gave rise. So it is that, whether in the polar seas, or in the heart of Australia, or in the deepest recesses of Africa, the disappearance of an explorer has often found its compensation in the progress of mankind by the energies called forth in solving the mystery. A. C. Gregory, who had explored the interior of Western Australia in 1846, and the Gascoyne in 1848, commenced in 1855 the series of travels in search of the Leichhardt party, which produced such valuable geographical results.

We now come to the efforts to cross the continent from south to north. I need not deal with all of these, nor with any at length, as they are within the memories of many of us in this hall. J. MacDowall Stuart's successful journey from Adelaide across to Van Diemen Gulf, Burke and Wills' journey from Melbourne to the Gulf of Carpentaria, and the terrible fate of this expedition on its way back, aroused much interest at home, as did also the work done by M. Kinley, as leader of one of the many expeditions sent out in search of the Burke and Wills party. The names of Forrest (from 1869

to 1874) and Giles (1872 to 1875) must be added to this list of the leading explorers. It is important to note that exploration in Australia was quickly followed by settlement, wherever the nature of the country permitted it. An Australian writer has observed of the squatters, "these men and their subordinates were close on the footsteps of the explorers, and should the adventurer remain some months absent from civilization, he found, on his return, settlement far across what had been the frontier line when he departed." Here is again displayed the same spirit of individual effort in colonization which we noticed in the Dominion of Canada, and which differentiates our race from other races in modern days. Passing from exploration and settlement to the question of consolidation, it is unnecessary to make more than a passing reference to the Federation, which came into effect on New Year's day, only three weeks before the close of the Victorian age; for all that could be said on this subject has been quite recently said in the Home and Colonial Parliaments and press. Although the general review of the geographical and hydrographical work of the Royal Navy is, fortunately, outside the sphere marked out for me this evening, no story of Australian exploration would be complete without some reference to the celebrated survey of the entire coasts of the continent during seven years by H.M.S. *Beagle*, first under Captain Wickham, and after him Captain Stokes. She sailed from England only a few weeks after the accession of Queen Victoria. This voyage should not be confounded (as it often is) with the earlier voyage of the *Beagle* round the world, including a visit to Australia—a voyage to which we owe the delightful journal of Darwin. A few lines at the close of that journal seem appropriate to-night. Darwin wrote as follows: "In the same quarter of the globe, Australia is rising into a grand centre of civilization which, at some not very remote period, will rule as empress over the southern hemisphere. It is impossible for an Englishman to behold our distant colonies without a high pride and satisfaction. To hoist the British flag seems to draw with it, as a certain consequence, wealth, prosperity, and civilization."

The following figures will show the extent to which this prophecy has been already fulfilled: The white population in 1837 was about 131,000, the export and import trade with the United Kingdom was about two million pounds sterling; the entire exports and imports amounted to less than three millions; and the revenue collected in the colonies was under half a million. The white population is now estimated at over four millions; the combined export and import trade with the United Kingdom is nearly 45 millions sterling; the entire export and import trade of the six colonies before federation was about 130 millions sterling; and the aggregate of their revenues was about 27 millions.

With such a record, our brethren under the Southern Cross may well

be proud of that watchword which finds a heartfelt echo throughout the British Empire—"Advance, Australia."

The settlement of New Zealand, though no less remarkable than that of Australia, did not call for exploration on a large scale, inasmuch as no point in its islands is 100 miles distant from the seaboard; so that it does not offer the same material for geographical notice. It was not until after Her Majesty's accession that the occupation of New Zealand was commenced by the New Zealand Company, another creation of the indefatigable Wakefield. It is wonderful to note how, within a single reign, New Zealand has been made into a country almost as settled as England. The main cause has been, of course, the energy of the settlers; but a great debt of gratitude is due to Wakefield's Company, which carried on its valuable work until its dissolution in 1851. The existing Colonial Government was established by the Act of Parliament of 1852. Since that time exploration has been mainly carried out by the Colonial Survey under Sir James Hector and Sir Julian von Hocht. Here are a few figures showing the growth of the colony: In 1896, the population, exclusive of aborigines, was 703,000. The revenue in 1899 was nearly five million sterling. The export and import trade with the United Kingdom aggregate about 13½ million pounds, and the total exports and imports are about 20 millions.

Before leaving Australasia, British New Guinea, which was founded by an Act of Parliament in 1887, calls for notice at a geographical gathering, owing to the excellent work done by its late Governor, Sir William MacGregor.

I have decided to treat the subject of Africa very briefly. This is certainly not from want of material, either from the point of view of geography or from that of expansion of the Empire. Three or four years ago, our President, speaking in this hall on geographical exploration, said, "The continent of Africa was a vast blank on the map of the world in the year of the Queen's accession, and its subsequent exploration has been in great part due to the energy and liberality of this Society, of which Her Majesty is the Patron." Then again, as regards political expansion, it is certain that immense areas have been added to the Empire in that continent. Nor, again, can it be said that the progress of exploration and expansion in Africa has been steady and almost mechanical as in Canada, and therefore not presenting many salient points of interest. Just the contrary is the case. Owing to the vastness of the continent, to the immense native populations massed in some parts, to the climatic conditions, and finally to international and political causes, the story of British expansion in Africa is a long series of thrilling adventures, terrible hardships, sanguinary wars, and keen diplomatic struggles. It might seem, therefore, to call for treatment at considerable length. Nevertheless, there are valid reasons to justify a more concise method. In the first place, our political

expansion there is the recent outcome of a continuous and extremely heated international scramble, which—during the last sixteen years—has more than once brought Great Britain to the verge of a European war, and which wrung from Lord Salisbury the cry that Africa had been created to be the plague of Foreign Offices. It seems to me that one cannot now deal in any adequate way with that controversial history before a Society which, though never forgetting that it is a British Society, invites geographers of all nationalities to its meetings, and pursues the even tenour of its scientific and therefore cosmopolitan way in the acquisition, encouragement, and diffusion of geographical knowledge. In the second place, passing from political expansion to statistics, another result of the neogenesis of British Empire in Africa is that, for much of the territory acquired, statistics of revenue or commerce would be altogether misleading as a criterion of the potential values of these new possessions, while exact statistics of population do not exist, and mere estimates are very untrustworthy. For instance, in one province, Nigeria, some experienced travellers and geographers have estimated the population as high as 40 millions, and others as low as 20 millions. Even statistics of the area of British possessions are wanting in exactness, that area varying between $2\frac{1}{2}$ million square miles and $3\frac{1}{2}$ million square miles, according to the political points of view from which you choose to regard it.

Lastly, in regard to the geographical work of British explorers during the sixteen years since the scramble for Africa began—a work of immense detail performed by a great number of still living men—it would require more judgment (and certainly more courage) than I possess to draw a line between those who must be mentioned and those who must be excluded for want of time, while a long catalogue of names would be wearisome and serve no useful purpose. I propose, then, to deal only with the great preparatory explorations during the first forty-seven and a half years of the late reign, and to terminate with the momentous meeting of fourteen nations at the Berlin Conference towards the close of 1884. This story of exploration falls naturally into three sections, that relating to Western and Nigerian Africa, that relating to Southern and Zambezian Africa, and that relating to Eastern and Nilotic Africa, though the two last are, in a few cases, difficult to separate. I have put these three spheres in the chronological order in which they engaged public interest and support.

The discoveries of Mungo Park and Lander, the travels of Denham and Clapperton, and the enterprise of MacGregor, Laird, and Beecroft, had attracted much attention to Western Africa at the time of Her Majesty's accession. It was largely due to the Prince Consort that Parliament took up the question. The first effort was the Government expedition up the Niger in 1841–42, in the hopes of opening up relations with the populous and semi-civilized States in the region now

known as Northern Nigeria. In 1849 the Government proposed to attain the same object from the Mediterranean, and they dispatched Richardson with Overweg and Barth to Bornu, where the two former died. Barth then took command, and in the four following years made his celebrated journeys in the Central and Western Sudan. The Government next ordered the *Pleiad* to ascend the Niger and Benue, in command of Dr. Baikie, R.N., who, in 1854, reached a point not far short of Yola. In 1858, Lieut. Glover, R.N., afterwards Sir John Glover, ascended the main Niger in the *Dayspring* to Rabba, travelled thence to Boussa, and finally overland to Lagos. This was the last Government effort to open up those regions, and over twenty years passed before that work (to be coupled this time with the acquisition of political power, without which no advance can be permanently maintained) was again taken up and successfully carried out by private enterprise. But it must never be forgotten that this private enterprise would not have been conceived but for the information given to the world by the explorers of a previous generation. As the blood of the martyrs is the seed of the Church, so the expansion of the British Empire has, to a large extent, been the natural sequel to the lives and deaths of explorers whose labours may have appeared at the time to be unfruitful.

The exploration of Southern and Zambezan Africa during the Victorian age will always be associated with the name of Livingstone. His earliest visit to the Zambezi was in 1851; and the following year he started on the first great journey which made him widely known at home. It included the discovery of the Victoria falls, and the crossing of the continent from Loanda to the mouth of the Zambezi. So brilliant a success secured to Livingstone the support of the British Government and of this Society. In 1858 he started for his second great exploration, which lasted until 1864. He was accompanied by a young traveller, who was later to make the name of Sir John Kirk so familiar both as an explorer and as British Political Agent in regions much of which have since come within the circle of the Empire. The discovery of Nyasa Land, important as it has proved, was only one out of many results of these five years of constant effort. The subsequent labours of Livingstone, under the auspices of this Society, from 1865 until his death at Bangweolo in 1873, gain additional interest from the expeditions sent out to his relief, mainly under the auspices of this Society. The most important was that under Cameron, who, after he had convinced himself of Livingstone's death, crossed the continent from Zanzibar to Benguela. Two years before this, however, Livingstone had been relieved by Stanley, who thus laid the foundation for his subsequent work in the Dark Continent.

Of other explorers in Southern Africa, I will only mention Erskine and Elton (in the Limpopo and other regions) between 1868 and 1877,

and Joseph Thomson, who, on the death of Keith Johnston, directly after his landing in Africa in May, 1879, took command of his expedition, which had been sent out by this Society, and, after exploring Lake Nyasa and part of Tanganyika, discovered Lake Rukwa. But, apart from what we may call professional explorers, there have been a host of big-game hunters, to whom we owe much geographical knowledge of South Africa. Of these, the most famous is Mr. Selous, whose earliest thirteen years of wanderings, from 1871 to 1884, fall within the limit of time that I have set myself.

The explorations of Eastern and Nilotic Africa have attracted more sustained attention than that of either Western or Southern Africa, and they have been, for the most part, connected with this Society. Burton and Speke were despatched in 1856 to discover the great lakes reported to exist. Burton mapped out the northern half of Tanganyika, and Speke discovered the south shore of the Victoria Nyanza. In 1860 Speke was again sent, with Captain Grant, to discover the sources of the Nile. They reached the western shores of the Victoria Nyanza, found the outlet of the great river, and followed it down to Gondokoro, where they met Baker ascending the White Nile, after he had explored the regions of the Atbara and the Blue Nile. Baker, proceeding southward, discovered the Albert Nyanza, which had been missed by Speke and Grant. It is impossible to do justice here to the multitude of explorers who have contributed valuable information on the Egyptian Sudan and neighbouring regions; but a passing reference must be made to the first opening up of Somaliland in 1883, by Messrs. James, Alymer, and Lort-Phillips—a work which has since been so ably extended by Dr. Donaldson-Smith and other notable explorers.

I must now pass to the new era opened by the great journey of H. M. Stanley from Zanzibar to the mouth of the Congo in the years 1875 to 1877. Only the earlier portion of that memorable journey falls within what is now a part of the British empire; but Stanley's great discoveries were the torch that fired the dormant idea of developing and settling equatorial Africa. Although some years elapsed before that smouldering fire burst into flame, there were a few minds in Europe who saw that the partition of Africa was approaching, and who set to work to prepare for it, so that when the moment came, in 1884, they were ready to act instead of losing years in deliberating and creating the necessary organization. During that period of incubation, the Royal Geographical Society displayed great activity in sending out expeditions entirely at its own expense. The most important was that led by Joseph Thomson through the Masai country in 1883–84, in which he succeeded in reaching the north-east coast of the Victoria Nyanza, and also visited Mounts Kenia and Kilimanjaro. About the same time, the latter of these was explored and ascended by Mr. H. H. Johnston, who had previously visited other parts of Africa. I specially

introduce his name because, as Sir Harry Johnston, he has proved himself a brilliant administrator in British Central Africa, and is at present engaged in organizing a system of government for that great province of Uganda, which Captain Lugard (now General Sir Frederick Lugard) won for the Empire under the auspices of the Imperial British East Africa Company.

This ends my sketch ; but I would add a few words on a question which the future historian will assuredly ask :—In what spirit has this vast expansion of the Empire been conducted ?

Now, looking only at British America, Australasia, and Africa, because British India is outside my province to-night, these fall roughly into two sections, one of which is mainly peopled by white races capable of self-government, while the other is peopled by coloured races, which (when unprotected) fall a prey to cruel tyranny and inhuman fetish practices, or are devastated by unceasing inter-tribal war, or are swept away by the incursions of slave-raiding hordes.

Throughout the Victorian age, Great Britain has dealt with the white races on the principle of constitutional liberty, when assured of loyalty to the Crown and flag ; and the chief aim in dealing with the coloured races has undoubtedly been beneficence, though this aim, like other human ideals, has too often been marred by imperfect knowledge or faulty judgment. But perhaps the dominant note throughout this period of expansion has been the devotion to duty of those concerned in it, whether soldiers, sailors, or civilians ; whether in the United Kingdom or in the Colonies ; whether explorers of unknown regions or their supporters living within the bounds of civilization.

And it was that triple watchword of Liberty, Beneficence, and Duty which made our late Sovereign the perfect symbol of the cohesive forces that bound this vast Empire together ; her respect for the constitutional liberty of her subjects was only equalled by her deep human sympathy with all kind of suffering, and by that extraordinary devotion to duty, which was carried to the very verge of the grave. So it was that Her Majesty stood as the type and example of all that is best and truly greatest in our race : and as long as English history shall endure and wherever the English language shall be spoken, the last Sovereign of the Hanoverian line will be revered by our descendants as Victoria the Beloved.

III. ADVANCES IN ASIA AND IMPERIAL CONSOLIDATION IN INDIA.

By Colonel Sir THOMAS H. HOLDICH, K.C.I.E., C.B., R.E.

When we turn from the magnificent record of geographical enterprise, closely associated, as it has been, with the advance of Imperial interests in Africa during the last sixty years, to the records of progress in

scientific research in Asia, we may at first be struck by a sense of disproportion in the extent of the results attained. Here are no vast bands of forest and mountain, no continental widths of plain and morass, to be traversed for the first time in the history of the world's research by the wearied feet of the geographical pioneer, but a very, very old world indeed, a world so old that its intermittent phases of past civilization have been utterly lost in the sleep of oblivion, and it is for us, the geographers of the present day, to dig out their skeletons and to reconstruct from the fleshless bones the full outline of its former development. There is, indeed, little analogy between Africa and Asia. Our most venturesome and intrepid explorers for the last half-century have but followed the footsteps of Old World travellers, and told a tale which must have been told centuries and centuries ago. We have but restored to the world what the world well knew once before, but we have restored it in a form which precludes the possibility of any further relapse into obscurity. We have given the geography of Asia a scientific basis and a constructive anatomy which must last as long as the world lasts; and thus the old, old continent takes new shape, shedding its mantle of mystery, whilst it is finished and fashioned and fitted with all the latest improvements by the modern map-maker.

In the year of grace 1837, when our late Queen ascended the throne of England, Russia was still behind the Caucasian barrier; Persia and China were for the most part regarded with Arabia as regions of speculative inquiry; High Asia was a nebulous sea of uncertainty, with the face of its past civilization battered beyond recognition by the destructive Mogul; Siberia was a boundless waste of snow-covered steppes where desolation reigned supreme, and men went as to final perdition, without hope in this world, and no promise of a comfortable exit into the next. Such, at least, were the popular views of the geographer of 1850, and I am old enough to remember something of their nature in the early days of my boyhood. Nothing has changed except men's knowledge; and this has grown with the growth of empire, of Russian Empire and of British Empire, till the wildernesses and deserts of our imagination have blossomed into fields and prairies, and the wealth which our ancestors passed by unheeded is enriching the world.

All this has been brought about by the slow and certain process of Imperial advance, carrying with it all the accessories of civilization, which sweep clean the rottenness that underlies the undergrowth of small and semi-barbarous nationalities choking their roots and stunting the growth of wide and wholesome development; and it is this which has distinguished Asia no less than Africa in the history of the world's advance during the last century. But, coincident with this advance, and due to it, very much has been done to make the byways of the Old World plainer to those who study them, so that they may read on

the face of the map as they run, and not involve governments in grievous geographical blunders. There is hardly a corner of Asia which has not been visited and examined and mapped during the last fifty years. The researches of Doughty and Bent and Blunt, in Arabia on the west, have been balanced in the far East by such a host of determined far-searching explorers that it is impossible to enumerate them. The names of Gill, of Margary, of Baber, Colquhoun, Younghusband, Bell, Woodthorpe, and Glass, will occur to you all. They are sufficient to sustain the reputation of Englishmen as foremost in the geographical field of eastern Asia. An immense mass of information has been collected and collated by these members of our Society. They have unravelled the riddle of Eastern hydrography in its early beginnings, showing us where the Brahmaputra, the Irawadi, the Salwin, the Mekong, the Hoang Ho, and the Yang-tsi trace their sources; they have unfolded the magnificent resources of Central China, and proved the possibility of reaching them from India; they have set a definite line of partition between British and French interests in the Far East; and they have mapped out the world of mountains between Assam and Lower Burma. The far north of Asia has yielded up all secrets worth knowing to the patient, unwearying persistence of Russian explorers and Russian surveyors, and it has been for us Englishmen to keep pace in the south with the advance of Russian scientific expeditions in the north; to take up, as it were, the geographical glove which has been cast at us from beyond the Himalaya, and see to it that we were not outpaced in the search after knowledge. We have no reason to be ashamed of our share in the scientific contest. Into the central region of vast elevations and depressions, whilst we have watched with admiration the advance of such giants in geographical exploration as Prjevalski and Sven Hedin, we Englishmen have sent a very creditable contingent of inquirers. The names of Shaw and Hayward, the Stracheys, Trotter, Dalgleish, Bower, Littledale, Younghusband, Wellby, Ney Elias, Curzon, Conway, Deasy, are all familiar enough to this Society and to the world. Through them, and others like them, we have learnt all that there is to know of the general physiography of High Asia, including that land of ancient mystery, Tibet. And to these names there are yet others to add which are not so well known, the names of those patient workers in the geographical cause who have been sent out from time to time from India across the great chains of Himalaya by the administrators of Indian Survey Department; natives of the country (sometimes natives of the very land they set out to explore); men who have faced all difficulties and braved all dangers, who have been to Lhasa and mapped it as if it were London, and who have carried through their work from end to end a well-connected chain of scientific observation, incorporating the whole into an accurate record of trans-Himalayan geography. Amongst them we may select the names of Nain Sing and Krishna as

typical workers. Now all this great advance in what we may rightly term scientific geography has occurred not only during the long reign of our late Queen, but well within the latter half of it, and it could never have assumed the high value which we may fairly claim as its due (a value which we measure by the standard of accuracy rather than of extent) had there not been a sound and assured basis of accurate geodetic deduction from which to start. For this we must turn to India.

What was our geographical position in India in those comparatively early days of the century just passed away, when our great Queen first assumed the responsibilities of monarchy?

Take any map of India that existed before 1840, and you will see it plainly marked. Draw a line from the head of the Gulf of Kutch, on the western coast, due northward till it reaches a point about level with Sukkur, on the Indus, where the great cantilever bridge now spans the river and carries the North-Western railway across it. From this point slant the line north-eastward till it hits the upper reaches of the Sutlej river below the Himalaya, and you will have a fair presentment of the north-west frontier of India in the days of Lord Auckland. Beyond it lay the unlimited flats and sands of the Punjab and Sind, so little known that we find written across the blank space intervening between the Sutlej and the Ravi, "Here dwell an erratic people called the Khattia." But with all the geographical uncertainty that overlay these regions beyond the frontier, there were here and there districts and positions which were not inaccurately laid down. The valley of the Kabul river, for instance, the historical high-road of the conquerors of India, is not vaguely expressed; and the position of the main passes across the frontier hills is relatively maintained throughout, although the names are misplaced. When the gallant Wood set out on his voyage of exploration up the Indus and terminated his quest at the Lake of the Pamirs to which he gave the name of his young Queen (a name which, through the courtesy of Russian geographers, is to be retained through future years by a lake which is now half Afghan and half Russian), he was received with suspicion. Coming events were even then casting long shadows before. In 1843 Sind was annexed. Within the next ten years the red line had passed round the Punjab, had included the Berars in Central India, and had encircled Lower Burma on the east. In 1856 Oudh was coloured red; and finally, after a long, long interval, Upper Burma joined us in 1885. Thus since 1840 six great provinces, covering 450,000 square miles of country and including fifty million of people, were added to India.

The great peninsula of India during this period has been gradually reduced from a condition of geographical vagueness to that of detailed map accuracy. There was in the year 1840 a vast space of the interior lying between the Godavari and the Bay of Bengal across which was written the word "unexplored"—and so indeed it remained absolutely

unexplored, along with many other minor tracts, a region of absolute darkness, until the seventies, about which period we may say that all geographical uncertainties were cleared up, and Indian exploration became a thing of the past. Meanwhile there had been growing up to perfection a system of minutely accurate geodetic survey, which has finally covered India with a network of triangulation second in scientific value to none in the world, which has furnished a basis for extension of accurate geography westward into Persia, Baluchistan, and Afghanistan, and northward to the Oxus and the Pamirs, and which has, in a secondary degree, supplied that data which was necessary for the scientific exploration of all High Asia. And with this grand development of practical geodesy, as much as with the scientific acumen which first saw the advantages to be gained from a system of exploration conducted by natives of the country based thereon, must ever be associated the name of my late chief, General Walker. To him, not as a great pioneer in the field of exploration, but as the guide and adviser of all pioneers, the constructor of a system on which such pioneering might be based with the result of assured accuracy, the friend and councillor of this institution, and the warm supporter of all geographical enterprise, I would award the first place in that great roll of English geographers who have maintained the honour of English science in Asiatic fields.

It seems fitting that on an occasion like this we should call to mind some, at least, of the names of those who have been so closely associated with this great Society, and whose voices we shall hear no more within those walls. Of the living I need not speak again. We have them with us, and we trust to meet them often; but to those who have crossed the last boundary into the great unknown lands we may well give a passing tribute of unforgetfulness. Along with Walker we have lost many whose names were well known on the list of Indian surveyors—Basevi, Montgomerie, Tanner, Harman, that gallant explorer Woodthorpe, McNair, and many another less-known hero have passed us by; Theodore Bent has left the fields of Arabia and Africa; Elias will no more tread the steppes of Central Asia, nor Wellby; Hayward has gone, and with him that later adventurer into the stern altitudes of the Himalaya—Mummery. These all rest from their labours, and their work is done.

And what are we to say of such lights of Asiatic geography as Rawlinson and Yule? Such names as theirs will never die. They will echo down the roll of ages for century upon century. Their works are their monuments, and that work which they lived to accomplish is a work which yet speaks and gives life to geographical enterprise.

I have been asked to say something of the consolidation of the British Empire in Asia. For its material consolidation we must look to those physical changes which the addition of territory and the

enlargement of its borders bring about. For that consolidation which means unity of purpose and bond of sympathy between the many nationalities of which India is composed, we must look to the condition of the people under new developments of civilization, and to their loyalty to the throne.

I have said that since 1840 six great provinces and a vast number of people have been brought under British dominion, until the total area of British India is measured by one million of square miles of territory, peopled by 200 million inhabitants. The Presidencies of India exist no more, British India is now represented by eight provinces, each under its own administrative staff answerable to one supreme head, the Viceroy of India. Within it, each under its own native administration, are a multitude of native states enjoying various degrees of independence, and these collectively represent about another half-million of square miles in area, and from 50 to 60 millions of people. Beyond this again there stretches a great area of trans-frontier country, Baluchistan and the independent districts of the Pathan border, reaching to the frontiers of Afghanistan, which must be regarded as being independent only in the sense in which the native states of the peninsula are independent. It would take more time than is at my command to define the exact degree of independence claimed and exercised by each, but it is well in these days to remember and to recognize the actual facts of that independence, and to bear in mind that for the last forty years no material shifting of the red line westward has taken place. Where the stern old Sikh drew his frontier line at the foot of the hills, there (in spite of the fact that we occupy advanced posts, and are in strength on certain strategical lines) is our frontier still. Only in Baluchistan have we definite official footing on the red patch which centres about Quetta, and which we call British Baluchistan. It is in the east, in Upper Burma, that the great material change of extension of territory is most boldly marked. But whilst the peninsula of India extending to Burma is the visible expression of British Empire in Asia, we must regard its consolidation as dependent on the measure of our capacity to govern and to defend it; and this means a sure and determined hold on the borderlands between ourselves and Russia, or between ourselves and France. So that the measures which have been recently taken to define the exact limits of Persian, Russian, Afghan, or French spheres of influence respectively by the demarcation of boundaries must be regarded as so many factors in effective consolidation, just as much as should the occupation of those military posts and strategic positions which leaves the command of frontier avenues of approach in our hands. No empire can be consolidated which leaves a ragged border of indefinite sovereignty on its edges subject to perpetual political wrangle and dispute. Here, then, surely we have nothing with which to reproach ourselves. If

the past century has brought with it great additional responsibilities and a widening Imperial sphere, it has also seen a definite limitation set to any unjustifiable thirst for extension of territory, and a rounding off of the area of Imperial responsibilities which can but make for peace and settled government.

But the consolidation of an empire is not merely a matter of physical definition. That unity of sentiment amongst many peoples, which can only be brought about by good government, by the exercise of the qualities of justice and mercy, by the gradual increase in the material welfare of the millions, by their final contentment and acknowledgment of the success of our efforts in their behalf, is yet more important. What have we done for India by the introduction of perhaps the most successful scheme of administration that the world has ever seen? Is India the better for us, and are the people united and happier?

It would be easy enough to turn to the pages of blue-books and produce evidence of the extraordinary march of Indian administration; to trace out the steps whereby the cumbersome processes of government under the company which gave India to us have gradually given way to the present system, a system which is only made possible by railways; and to prove that the policy of decentralization, which has been the keynote of Indian administration for the last twenty years, has been the only one which could deal successfully with the problem of binding twenty different nationalities with as many different tongues into one compact and enduring empire.

We could then speak of the developments of civilization; of thousands of miles of roads where roads never existed before; of hundreds of square miles of irrigated land where there was nothing but wild waste; of railways whose united length would encircle the globe; of the creeping, growing change that these things are effecting in the caste prejudices of the people; of the transition from the India of tradition, the India of jungles and thatched bungalows and slow movement, to the India of the self-complacent globe-trotter, of flats, and hurrying, dusty, week-end skirmishes to and fro.

If material advance is to be measured by revenue, then it is satisfactory to record that the gross revenues of India, which in 1837 amounted to 21 million in pounds sterling, can now be reckoned at 95 millions, reckoned in tens of the depreciated rupee. How far that depreciation has affected the growth of empire, we cannot at present inquire.

But it is the people, after all, the silent, sullen people, who make the empire, and it is to them we would rather turn for illustration of the moral and material advance that India had made. That they are much better off (in spite of famine and pestilence) than they were, is a self-evident fact to any one who has had opportunity to study them in any one locality for a decade or two. Better houses, better clothes,

brass pots instead of earthenware, silver bangles twinkling on the women's arms and ankles,—all these things are the outward and visible sign of increase of material wealth, and they are evidences which can hardly be misinterpreted. They are at least abundantly manifest in all those parts of India where European civilization reigns. Amongst the 180 millions of agriculturists who form the bulk of the population of India, there must be times when scanty crops and consequent famine reduce vast multitudes to great destitution. But for all that, the normal condition of the Indian peasant, as that of the landowner, is vastly improved under our rule. It is well to remember the words of Strachey: "There has never been a government of India that has taken from the people so small a share of the profits of the soil as ourselves, and this is true for every province in India." If, as some seem to think (but as I do not think), the people of India in the mass are not contented and the happier for our rule, surely, in the words of another great statesman, they "ought to be." If we turn to the educated classes, we have no reason to despair. There are at least thousands of natives, men of intellect and wide influence, wise with the wisdom of the West as well as of the East, who point to the universities and the schools now existing in every part of the country with pride and confidence, and who amply justify the hope that our methods of improvement, our efforts towards the diffusion of knowledge, will yet avail as a strong support in the construction of empire.

But the strongest expression of that unity of nationalities which means a consolidated empire is not to be found in mere contentment of a people with their surroundings, or in the evidence of material advancement and wealth. It is unity of sentiment, the bond of common sympathy evoked by the call of a common allegiance to their ruler, which is the best guarantee for continued Imperial soundness, and without which no empire can hope to stand. In a word, it is the loyalty of the people to which we must look.

Are the people of India loyal, and if they are, to what extent has the influence of the first great Empress of India, our late Queen, been directed in its development?

Consider what India is. Remember that there must be 40 to 50 millions of people in that but half-known land who have certainly never seen the gleam of a bayonet or the face of a British soldier, and many of whom can never even have seen a white man. Can such a sentiment as loyalty be evoked in the breast of these half-reclaimed savages of the jungles? I think it can. I do not speak as a political economist—merely as an ordinary observer, who has walked and talked with the people of India for thirty years in their hills and jungles and plains, and has learnt a little of their moods and methods. I say that loyalty is an instinctive and natural principle implanted in the breast of every native of India. But it is the loyalty of personal attachment

to his ideal. A native will be loyal to his chief, loyal to his mulla, loyal to his friend, or loyal (ah! how loyal many of us can say) to his master or mistress; but he must have a clear definition, if an ideal one, of the attributes of the object of his loyalty. His mind must be clear, though his conceptions may be utterly wrong. Thus the wretched jungle woman who propitiates the goddess Mata (the beneficent mother who comes with small-pox in her hand to carry away her child), and builds little swings by the roadside with scant offerings of rice or turmeric to persuade good Mata to deal gently with her, would offer her starved and -battered heart in an ecstacy of adoration to the great Queen-mother, her Empress, with her womanly sympathies and her royal condescension, were there but the outward and visible presentment of sovereignty to fall down and worship. But she doesn't understand the Sirkar, the Government of India, which may indeed exist in high altitudes on the mountains of the north, but which shows little active interest in her poor struggle for life, if so be, indeed, that she has ever heard of the Sirkar at all.

A little higher in the scale of Indian humanity—amongst the swarming millions of agriculturists and the so-called educated classes, the zamindars and the mullahs, the priests, the babus and the Moham-medan pleaders, how much is there of real loyalty to the throne? I believe that the great mass of them are loyal by instinct and by tradition. They have known no government that was not a foreign one, and to them the freedom of republicanism is incomprehensible. Although education has advanced far enough to have induced a discontent which, amongst a certain section of the noisiest of them, takes the form of a simmering overflow of disloyal sentiment in their infant press, I believe this to be absolutely superficial. Their own literature, such as it is, teems with tales of regal splendour and magnificence, and captures their imagination by stories of royal condescension, of kings and kalifs descending to walk amongst their people and distributing a vicarious and ill-considered justice by royal command. It may be said that this is a sentiment only. If so, it is a sentiment which has pervaded all India, and which still wraps the throne in a mantle of idealism, still places loyalty to a living chief above all family affection and ties, and this sentiment I believe to have been warmed from a dead acquiescence in the rule of the Sirkar to a living, moving faith, since first a living Empress has been given to the people. What else was the meaning of the voices of prayer which went up from thousands of mosques and temples through the length and breadth of the land that our Queen might be safeguarded from death and restored from illness? The small voice of sedition was still then. There was never any real life in it.

For that great company of native chiefs and nobles who have shown their loyalty and devotion to their Empress on a hundred fields, I need answer no more than I need for the army of India. Strange indeed

would it be if the devoted loyalty of the British soldier (a loyalty which is a passion) had found no echo in the ranks of his fellow-soldiers who have fought shoulder to shoulder with him through the campaigns of an Empire. But, in truth, the quality of loyalty is not caught by contagion in India. It was always there, the hereditary possession of a race of soldiers who, so long as they can see and know whom it is that they serve, will serve with all the hereditary valour of their race. But with them, as with all the rest of us, the dead sentiment is quickened into life, and loyalty springs from the head to the heart, when the visible object of it is wholly worthy, Imperial in dignity and power, yet claiming human sympathy even as that sympathy is given. I have ridden many a long day's ride with a simple Mohammedan soldier who, to his eternal satisfaction, had been selected as a representative of the Indian army at our late Queen's jubilee. I knew that he had ridden with the Prince of Wales through many a magnificent pageant, that he had seen all that London had to show of England's wealth and power. Yet of all these wonders (for wonders they were to his simple mind) he had not a word to say; but he had everything to say of the gracious lady, his Queen, who had spoken to him five kind words and touched the hilt of his sword, who ever had at her side a man of his own faith and kin in attendance, who could speak his language *as a lady should speak it*, and who had even learnt to write it. His gratitude and his admiration were unbounded. Loyalty with him had become a life's faith. It was his Empress who existed for him for ever as the guiding-star of his devotions in camp or field.

I have not forgotten the mutiny or the lesson of unfaithfulness that it taught us. But I remember two facts in connection with it. Firstly, the people of India were hardly touched by the disloyalty of the army; and, secondly, that the army which mutinied was not composed of soldiers of the Queen. It may be said that faithfulness to a throne is the same thing as faithfulness to the executive government, which may happen to represent the throne. Loyalty to the one is loyalty to the other. It is so, but with a difference. I ask you, brother officers, who for many years have stood up to listen to that simple toast which is ever received with a silence that is eloquent, and which, alas! we shall hear no more with the old significance—"Gentlemen, the Queen;" should any mess president have deemed it wise to substitute the words, "Gentlemen, the Indian Government," would it have been the same thing to you or me? Hardly. And how should we expect it to be the same with the soldier of India? And it was the just appreciation of the true meaning of this difference, representing as it does a deep-rooted human principle, that prompted the wisest statesman of his time to give to the Empire of India a living Empress, to claim the hearts of the people as well as their heads, and thus to bind an Empire together with ties of a common sympathy and personal loyalty. I believe that

the keystone to the Imperial structure was set on that first of January, 1877, when our Queen was proclaimed Empress of India, and I believe that the bright clear light of her royal dignity, of her Queenly condescension, and of her womanly sympathy, has so bound together the sympathies of all the scattered nationalities of the East, that men shall say through all future time, "This was a consolidated Empire indeed, for it was built up on the hearts of the people."

IV. PRESIDENT'S ADDRESS ON THE ACCESSION OF KING EDWARD VII.

His present Majesty has received from us, as he will receive from all his subjects, the most sincere and most respectful congratulations on assuming the heavy burden of empire. All his subjects bear in mind the work of His Majesty as Prince of Wales, characterized as it was by untiring and unceasing devotion to duty, by unflagging industry, by great ability and perfect tact and judgment, and by warmth of heart. These high qualities accompany him as King; and we all loyally and earnestly wish that, following in the footsteps of his august mother, he may long be spared to the Empire as a great and wise constitutional Sovereign.

As Prince of Wales, His Majesty succeeded his revered father as Vice-Patron of this Society in the year 1862; and His Royal Highness made it no honorary post, but took a warm interest in our proceedings, was present at our meetings, and performed official functions on several occasions. In alluding to the Prince's gracious acceptance of the post of Vice-Patron, Sir Roderick Murchison truly said that no other heir apparent ever before made himself so good a geographer by extensive travels. The Prince of Wales was pleased to express great gratification at becoming our Vice-Patron, particularly as it was a post which had been occupied by his revered father.

The first great event after the Prince accepted office in our Society was the return of Captain Speke from the discovery of the Victoria Nyanza. Although His Royal Highness was unable to attend our very crowded meeting, he was so much interested in the discovery, that a special arrangement was made for Captain Speke to read his paper again at the Royal Institution, when the Prince could be present.

In 1869, in accepting an invitation from Sir Roderick Murchison to be present at our Anniversary Dinner, the Prince of Wales said, "Nothing will interest me more, or give me greater pleasure, than attending the dinner at which you preside. I have taken the greatest interest in the grand project for the exploration of Equatorial Africa."

During the tour of the Prince and Princess of Wales in Egypt, their Royal Highnesses were accompanied by Sir Samuel Baker, and the Prince interested himself most deeply in the question of suppressing

the iniquitous slave-trade of the upper Nile. It was through His Royal Highness's personal interference that such arrangements were made by the Khedive as induced Sir Samuel Baker to command the expedition, the fruitful results of which are so well known. At our meeting to welcome Sir Samuel Baker on his return, on December 8, 1873, the Prince of Wales took the chair, and made a speech of welcome to the great traveller on the part of the Fellows. His Royal Highness also became the Patron of our African Exploration Fund.

I mention this to remind you what a hearty and active interest His Majesty, when Prince of Wales, was accustomed to take in the affairs of our Society. His Royal Highness took a similar interest in our arctic work. He was present when the paper was read announcing the despatch of the Arctic Expedition of 1875, showing the great interest he felt in polar discovery, and giving encouragement to the gallant officers who were about to face the hardships of arctic service. On their return, the Prince of Wales took the chair at our meeting to welcome them, on December 12, 1876, and moved the vote of thanks to Captains Sir George Nares, Stephenson, and Markham, for their papers, concluding his speech with these words: "I ask you, ladies and gentlemen all, most enthusiastically and most cordially, to give the arctic leaders that hearty British welcome which they have so thoroughly deserved."

The Prince of Wales was again present at our meeting when Sir Henry Stanley read his paper on February 7, 1878, as well as on the occasion of the same traveller's reception at the Albert Hall in May, 1890. It will be still fresher in the memories of the Fellows of this Society how His Royal Highness dined with our club and attended the great meeting in the Albert Hall on February 8, 1897, for the reception of Dr. Nansen. At the request of the President and Council, the Prince of Wales performed the office of presenting to Dr. Nansen the medal which had been specially struck in his honour. The last time that His Royal Highness honoured us with his presence was on May 16, 1898, when we celebrated the fourth centenary of the voyage of Vasco da Gama. In addressing the meeting, the Prince said that he thought it most appropriate that we should join with Portugal in celebrating the fourth centenary of a voyage which had had so marked an effect on the history of the world in general, and of our own country in particular.

Perhaps it was scarcely necessary to remind you of the numerous occasions on which our Vice-President showed an interest in the work of our Society during the thirty-nine years that he has held that office. We now trust that His Majesty will be graciously pleased to accede to our request, and to become Patron of the Society in succession to his revered and illustrious mother, our late beloved and lamented Queen. His Royal Highness the Duke of Cornwall and York has also been

graciously pleased to attend several meetings of our Society. The Duke accepted the office of Honorary President of the Sixth International Geographical Congress in 1895, and delivered an admirable speech of welcome to the geographers from all the countries of the world, at the opening evening meeting. We trust that His Royal Highness will be pleased to accept the offer of Vice-Patron of this Society, in succession to his father.

His Majesty the King is Patron of our Antarctic Expedition, and I am sure we all confidently hope that its young and very able commander will illustrate the opening reign of Edward VII. by his contributions to geographical science, as Sir James Ross did that of Queen Victoria. Such patronage will not fail to be a great encouragement to officers and men.

We all most earnestly hope that not only geographical discoveries, but successes of all kinds, may brighten and render famous the reign of King Edward VII., that every blessing may attend him, and that he may long be spared to reign over a loyal and united people.

GOD SAVE THE KING.

EXPLORATION IN THE CANADIAN ROCKY MOUNTAINS.*

By Prof. J. NORMAN COLLIE, F.R.S.

IN February, 1899, I read a paper before this Society wherein I described two journeys, one taken during the summer of 1897 with Mr. G. P. Baker, and one with Messrs. H. E. M. Stutfield and Hermann Woolley in 1898. During these journeys we explored the eastern side of the Canadian Rocky mountains for a distance of nearly 100 miles, from Laggan on the Canadian Pacific railway to the sources of the Athabasca river. One or two explorers had been through the country before—Dr. Hector, Prof. Coleman, and Mr. Wilcox—but they had for the most part followed the valleys; few attempts had been made to investigate the great snow-fields and the surrounding peaks that form the backbone of the country. We penetrated into the very heart of three out of the four great plateaus of ice and snow—the Wapta, the Freshfield, and the Columbia *névés*; also by ascending some of the high snow-peaks near to these central reservoirs of ice, we were enabled to obtain considerable knowledge of the whole range.

The Columbia ice-field is by far the biggest accumulation of glaciers we have yet seen. It covers an area of at least 100 square miles; moreover, from a geographical point of view it claims additional interest, for it is the source of the great rivers, the Athabasca, the

* Read at the Royal Geographical Society, January 14, 1901. Map, p. 332.

Saskatchewan, and the Columbia. Also, probably some of the highest peaks in the Canadian rockies, Mount Columbia, Mount Alberta, and Mount Bryce, surround this desolate spot. Another peak, the Dome, situated near its centre, on whose summit we stood in 1898, is probably the only mountain in North America the snows of which, when melted, feed rivers that flow into the three oceans—the Atlantic, the Pacific, and the Arctic.

Although, therefore, we had obtained a fair knowledge of the eastern side and the centre of the range, yet to the west an unknown country lay. What was there on the other side of the Freshfield, the Lyell, and the Columbia groups? Were there great glaciers and further outlying mountains? Did the valleys run straight to the Columbia, or, like those on the eastern side, lie parallel with the range? Were the bottoms of these valleys

MAP OF CANADIAN ROCKIES.

Owing to the failure of the lithographers to deliver Professor Norman Collie's Map of the Canadian Rockies in time, its issue is postponed till the April number of the 'Journal.' In binding the volume, it should be inserted at p. 332.

Columbia running north-westwards parallel with the mountains.

After we had returned to Banff, Stutfield visited Donald to inquire about the possibilities of getting down this Columbia valley. He was told that a pack trail had been cut as far as Boat Encampment, or, as it is now called, the Big Bend, this trail being used by prospectors and others going to Tête Jaune Cache and the headwaters of the Fraser river. But he could obtain no information about the land that lay between that trail and the main chain of the mountains. He, however, made up his mind that if it were possible to cut a trail up either the Bush or the Wood river, much of the uncertainty that enveloped these western valleys might be cleared away, and perhaps, should we be fortunate enough to reach the base of either Mount Columbia or Mount Bryce, these giant peaks might be ascended more easily from the western than from the eastern side. Stutfield therefore wrote early in the year to T. E. Wilson, of Banff, who has always supplied us with men and horses, asking him to make inquiries about

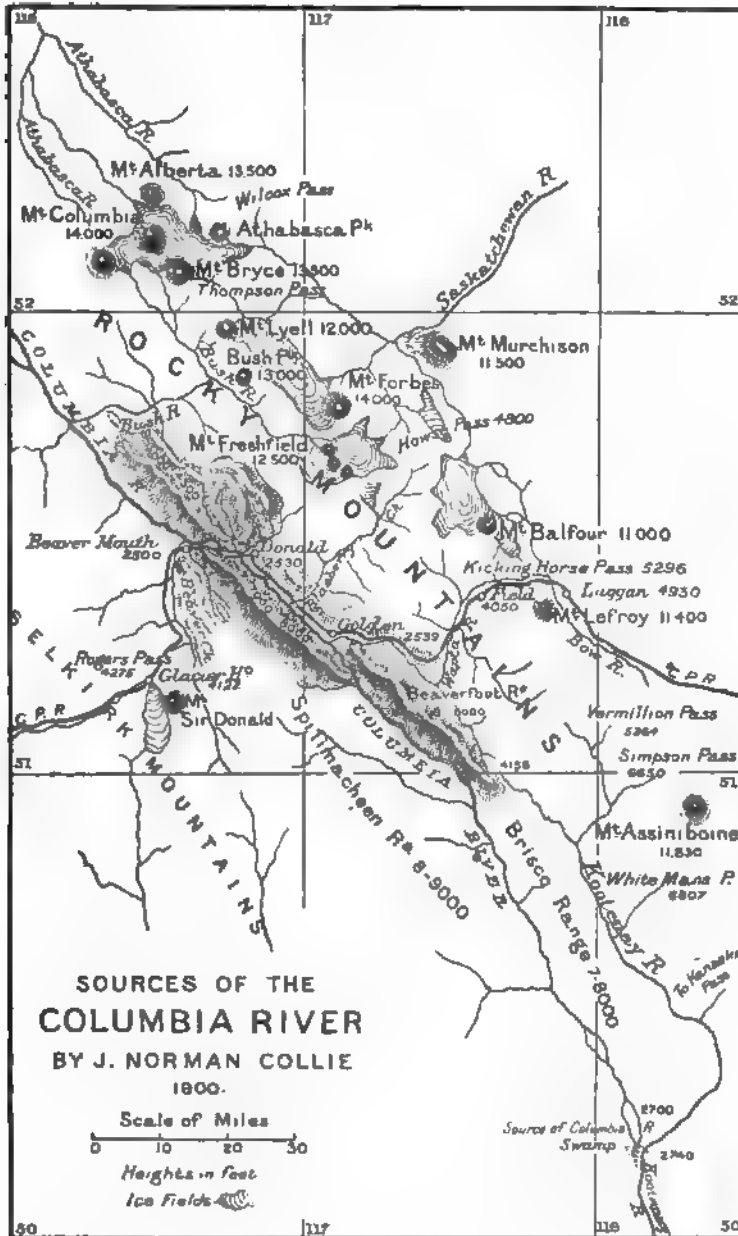
the Bush valley. Wilson therefore went over to Donald, where he met a trapper who eight years before had been up the Bush river as far as the foot of the main range. This trapper gave it as his opinion that the muskegs, the river, and the thick timber would make it extremely difficult, if not impossible, for horses. This seemed to be in the main probably true, for Hector had found great difficulty in forcing his way down one of these western valleys, the Blaeberry. Wilson also, many years ago, had been obliged to abandon all his horses in the same creek, only recovering them a week later by the help of several men, who returned with him and eventually cut them out of the thick timber.

In 1897 Baker and I also had entirely failed to make our way down this creek, and finally only escaped by traversing a new and high pass to Field on the south. When, therefore, Stutfield asked me last summer to join him in his expedition up either the Bush river or the Wood river, I felt that we were attempting a much more difficult task than anything we had done before on the eastern side of the mountains. One thing, however, was certain—a good trail existed along the Columbia river as far as the Big Bend, and should we decide to turn up the Bush river, although it would no doubt be difficult, still the actual distance up the Bush river to the snow-fields on the divide could not be much over 25 miles. Our party consisted of H. E. M. Stutfield, S. Spencer, and myself, Fred Stephens as headman, C. Black, H. Lang, and A. McAlpine.

On July 29 we started from Donald along the Columbia trail. The Waitabit and Bluewater creeks were soon passed, but the fact that the volume of water in them was small and did not contain glacial *débris* obviously meant that no great area of mountain country was drained by them; also that either they came from lakes, or had their rise in the small foothills where no glaciers existed. Our trail from Donald to the Bush river lay through dense forest nearly all the way; nowhere could an extended view be obtained, and the Columbia river was left far off to our left. For just below Donald the river makes an abrupt turn to the westward through a canyon, made, no doubt, long ago by the water finding a weak spot in a low range of hills which lies nearly parallel with the valley of the Columbia. The trail led us along the eastern side of this low range, and, as it ultimately happened, we never saw the Columbia again till we returned to Donald.

The vast forest through which we travelled far surpassed in size anything that we had seen on the other side of the range, huge pines, cotton-wood trees, and firs reaching to a height of 150 feet or more. The undergrowth was very dense; cedar, white maple, and alder (near the streams) abound, whilst the fallen trunks of dead trees, sometimes 6 or 8 feet through, lay scattered with others of lesser size in every kind of position. Some in their fall had been arrested by

others, and were waiting for the first gale to bring them crashing to the ground; whilst at the will of every breeze that wandered through



the upper branches of the higher trees, these half-fallen monarchs of the forest would break the heavy stillness of the air by their complaints

and groans against their more sturdy brethren for thus preventing them lying at peace upon the moss-covered ground below. Others that had lain for perhaps scores of years in the wet underbush had decayed and rotted, leaving rich masses of decomposing vegetation, from which smaller trees had sprung that in their turn also must fall and suffer the same change. There is a marvellous fascination about these immense quiet and shady fastnesses of the western valleys. As one wanders day after day through this underworld, cut off from the glaring sun of noonday and the blue sky, hardly a sound breaks the stillness, whilst all around the ruin of ancient woods lies piled with a lavishness most absolute—that of Nature's self, the tangled wreck of a lifetime, the luxuriant growth of centuries.

Here it was that we first made the acquaintance of that pest of British Columbian forests—the devil's club, a plant with large and broad leaves and a stem covered with spikes. Amongst the moist undergrowth this plant grows to a height of 5 or 6 feet, trailing its stems in every direction, and emitting a dank, unwholesome smell. These spikes, when they enter the flesh, break off, producing poisoned wounds which fester, and whilst cutting trail it is impossible to prevent the long twisted roots flying up occasionally, leaving their poisonous thorns in all parts of one's body. After crossing the Blue-water we followed a smaller creek, the Blackwater, in an almost northerly direction. This latter rises in some lakes, one of which at least is full of rainbow trout averaging about three-quarters of a pound. The highest of these lakes, which is situated on what might be termed a low pass, is about 800 feet higher than Donald, and from that point to where the Bush river is reached the trail descends. These lakes must be situated 5 or 6 miles from the Columbia river.

On August 3 we reached the Bush river, a deep, sluggish, and muddy stream, about 200 yards wide, and running between steep banks that obviously earlier in the year had been overflowed. It must be deep, for even at the bank there is 8 feet of water. The thick forest comes down to its very edge, and the floods that earlier in the year were produced by the melting snows had deposited for some considerable distance away from the stream a white sticky mud amongst the roots of the trees; swamps, too, were of frequent occurrence, and the thickets of willows, alders, and other small trees, together with much fallen timber of a larger size, made all hope of getting the horses through such a forest seem absolutely impossible. We found three boats moored at this crossing, two on one side and one on the other, with what appeared to us very insecure fastening—merely an old rope attached to a small stake driven into the mud on the top of the bank. These boats are for the use of travellers who are journeying to the Great Bend, and had been brought down the Columbia from Beaver creek. Stephens crossed over in one to the opposite side, to find out whether any trail



existed up the Bush river on the northern bank; but as only thick woods and swamps were discovered, he returned.

The weather now was very hot and sultry, and we camped near the Bush river by a small lake. That evening and night swarms of the most voracious mosquitoes I have ever come across nearly drove us distracted; as it was quite impossible for us to protect ourselves, early next morning a rapid retreat was made 5 miles back along our trail, to a spot less inhabited by this maddening scourge.

A mountain spur, forest covered, now divided us from the upper part of the Bush river. Over this we hoped to find a way. During the whole of next day Stephens and Lang were engaged in cutting



FOREST SCENE, BRITISH COLUMBIA.

about a mile of trail through the woods to the bottom of the steep ascent of about 1000 feet that led to the top. It would have been folly to attempt to take heavily laden ponies up this hillside; so, to get over the difficulty, the whole of next day was spent in completing the trail to the summit, and at the same time transporting half our baggage to the top, where it was left. From the summit of the ridge, which I have called Mount Pisgah, we got our first view of the snow mountains and of the valley through which we should have to wander for probably many days before arriving at the promised land. The country that lay stretched out before us at our feet made us feel very undecided whether to be pleased or otherwise. Certainly there were no narrow canyons

or defiles that would require lengthy *détours* up precipitous hillsides, and the valley was long, flat, and open; but we could see muskegs, streams, and shingle flats all tangled together, looking like a skein of ravelled grey wool thrown down between the dull green hills; whilst the main river, winding first towards one hillside, then towards the other, sometimes branching, again reuniting, formed a veritable puzzle of interlacing channels, islands of pebbles, stretches of swamps and small lakes, all hopelessly intermingled. At another place the water would spread itself far and wide over the flat floor of this desolate valley, and we wondered how long it would be before we could win to the foot of a splendid snow-peak that stood boldly up alone and solitary some 12 or 15 miles away. We hoped that this mountain was Mount Bryce, but, as it turned out later, we were destined to be disappointed.

Next day we loaded all the horses early with the remainder of the baggage. As there was no water on this mountain, at least anywhere near where we should be, it was absolutely necessary to get down on the other side the same day. This we eventually did, but only after nearly twelve hours' fighting with the forest. During our descent to the Bush river, one of our horses stampeded from the trail for about fifty or a hundred yards; but we could not stop to extricate him from the maze of fallen timber, even although he was laden with bacon, and it was not until next day that Stephens rescued him by the help of an axe, no doubt very thirsty and hungry. By barometer we were now just about the same height as Donald—2500 feet. During the night the barometer fell two-tenths of an inch, and next day we were treated to the kind of weather that more or less lasted till the end of our trip—rain, dull grey sky, and lowering clouds over all the mountains. As a matter of fact, we afterwards discovered that last August was the most unsettled and the wettest that had been experienced in the Canadian Rockies for many years.

On the 10th the provisions that had been cached on the mountain were brought down by Stephens, whilst I got my first experience of a kind of work that later was often to be reserved for me, namely, trail-cutting. To any one unaccustomed to using a heavy Canadian axe in a thick forest, it is decidedly hard work. Not only is one ignorant of how to cut through the fallen pines in the most expeditious way, but one is using a set of muscles rarely employed by the average man who follows a professional life in a large town. I should strongly advise any one visiting these western woods of Canada to take a light axe that can be used with one hand; for the brushwood it would be invaluable.

The next day, Saturday the 11th, saw us start along the southern bank of the Bush river. Hemmed in by the river against the hillside and the occasional muskegs, progress was very slow, and at last Stephens

thought we might try to ford the main stream, which at this point was about 200 yards wide. Here our troubles began. No sooner was Stephens about halfway across, than half a dozen of our baggage animals followed him. This, of course, should have been prevented, for, as it turned out, under the opposite bank the river was both deeper and stronger. There Stephens narrowly escaped drowning, when his horse, during a violent effort to climb the opposite bank, finally fell over on to him in the deep water. Lang also had managed to cross; but we, wishing neither to get wet to the skin nor to be swept down-stream, waited where we were. Finally, after unloading the horses, Stephens built a very shaky kind of raft, on which he and Lang



BUSH RIVER AND RAFT.

attempted to return. The main current, however, soon caught them, and they were swept rapidly past us down-stream. Just below this, Lang, probably in an attempt to pole the raft in water which must have been at least 10 feet deep, lost his balance and fell overboard into the icy water, his heavy boots dragging him down, and but for the presence of mind of Stephens, who crawled along the raft with a pole just long enough to reach Lang, there is little doubt that in a few moments he would have been drowned. There is no difficulty in launching a raft into the centre of a swift-flowing river, but to reach land again is a very different thing, and if it had not been possible to throw a rope to these two as they drifted rapidly round a sharp bend in

the stream about a quarter of a mile below, perhaps they might have sailed in a very short time to the unknown lower reaches of the Bush river. That night we camped on wet mud all together in one tent (the other was across the river), glad, however, that nothing worse had happened. Next day, undaunted by his experience, Stephens started to build another raft on a more magnificent scale, whilst I cut trail along the steep hillside that came down to the river's bank. This time success crowned Stephens' efforts, for by himself he got across, drove the horses back unloaded through the stream, and finally arrived safely with all our precious baggage on the raft.

On the morrow, some 3 miles further up the valley, we nearly lost all our meat. This was whilst we were edging along a narrow piece of very muddy land between the swamps and the river. Two mares deliberately walked straight off the bank into the main stream, which was at that point over 10 feet deep, and running strongly. One of them had 250 lbs. of bacon on her, consequently she went straight out of sight, but came up again for a moment some 20 yards lower down, only to disappear again. Fortunately, her next appearance was close against the bank, when two of the men promptly seized her. The other mare had also been washed against the bank, but, being unloaded, was easily hauled out; the other, however, with the bacon was underneath a mass of willows, and all we could do for some time was to keep her head above water, as she could not touch bottom. Eventually, by the help of a rope taken from one of the packs and seven men pulling, she was landed on her side on the bank, half-strangled; but our meat was safe. Again that night we had to camp in a swamp.

The days that followed were all spent in much the same fashion as the preceding ones. The river kept us prisoners on the south bank till the afternoon of the 16th, when we crossed at a place where it is spread out over a wide area of shingle flats, and camped at a point just opposite a shoulder of the high peak we thought was Mount Byrce, also just short of where the river forks. In ten days we had only made about 10 or 12 miles at the most as the crow flies, and in height had risen about 300 to 400 feet. Down the valley the main river winds backwards and forwards across the valley with innumerable side channels. The banks are covered often with a dense growth of willows, behind which are swamps and small lakes, fed often, no doubt, by the main river when in flood. Beyond these swamps rise the valley-sides, clothed in the densest forest. Our way was alternately through all of these, sometimes climbing and log-hopping up the hillside, cutting through the accumulated fallen rubbish of years, sometimes splashing and plunging through the swamps, sometimes fording side streams, sometimes squeezing our way through dense thickets of willow; all were tried, and we were entirely unable to say which was worst. Stephens was of the opinion that the north side, if we could have reached it, would afford much

better going; perhaps it might, certainly it could not be much worse than the south side.

The Bush river flowed from our camp in a westerly direction, but about half a mile up-stream the main valley was blocked by mountains, two valleys joining at this point, both being nearly at right angles to the valley we had been in for the last ten days. We were under the impression that the high peak that had been in front of us all the way up the Bush river was Mount Bryce, and therefore expected to find the



THE HAUNT OF THE WILD GOAT.

Columbia ice-field not many miles away round the corner to the north. Next day it rained steadily, and we did nothing; but on the morrow, as it cleared somewhat in the afternoon, leaving the horses, we climbed about 2000 feet up the mountain spur that lay between us and the north fork of the Bush river.

The mists lay low on the snow-peaks, but we saw that about 2 miles up the north fork a valley came in from the east, and glaciers lay at its head some 5 or 6 miles distant. The north fork itself stretched

away for miles, filled with dense pine woods ; occasionally small shingle flats could be seen, and under the dull grey sky presented a dreary and inhospitable appearance. But Stephens talked of shooting cariboo, goat, and perhaps, if we were very fortunate, some big horn sheep. Black, however, gave it as his opinion that it was a country forsaken both by gods and animals, much to be condemned, and no fit place for a white man. Still, the appearance of the valleys puzzled me ; it was somehow very different from what I had expected.

On the morrow Stephens went out to investigate the north fork, whilst Stutfield and I crossed the river, and after several hours of log-jumping of a most tiring description, we reached the south fork a little above where it joins the other stream. At this point the stream runs through a deep chasm out of the rock 200 feet deep. Here our exploration stopped, for we could not cross the river ; so, finding the whole hillside covered with blaeberries the size of small grapes and of exquisite flavour, we had our lunch, and then returned to camp. One thing only had we discovered : far away up the north fork, how many miles we were unable to tell, we had seen Mount Columbia a beautiful pyramid of snow surrounded by great glaciers. Fred Stephens and Lang had been 4 or 5 miles up the north fork, passing a small shingle flat and the mouth of the valley that came in from the east. They reported that the fallen timber was dreadful, and that trail-cutting would be necessary every step of the way ; moreover, that along the west bank gullies and steep hillsides with occasional small precipices seemed to entirely prevent us getting the horses along, unless we could cross the stream to the eastern side. By this time we were beginning to get anxious, for we had been out twenty-two days, which left us only a fortnight more. Something must be done, and quickly. Next day, therefore, August 20, Stutfield, Spencer, and I decided to climb to the top of the peak that lay in the angle between the north fork and valley up which we had come. As it turned out, it was both the finest and the most fortunate day of our trip. All the mountains of the main range were free from clouds, and we had a superb view from the summit of the peak when we got there. During the whole of the remaining fortnight that we were in the mountains the clouds never entirely lifted from the high peaks, and had we missed the view that we got on that afternoon, much of the knowledge of the geography of the district would never have been acquired.

The climb of about 5000 feet was very fatiguing ; we had to fight almost every inch of our way through thick scrub or fallen timber. Just as I arrived within 100 feet of the summit, and was coming round a corner, I almost ran into an old he-goat ; he was less than 100 yards away. After he had looked at me for some time, he went on eating, so I photographed him. Certainly he could have never seen a human being before.



Once on the summit, I at once recognized why the head of the valley had seemed different from what I had expected. Ten miles or more to the northward, up the north fork, was Mount Bryce, and beyond that Columbia and the great snow-field, with even the Twins showing far away at the headwaters of the Athabasca. Almost due east was Mount Lyell; we were therefore 10 to 12 miles south of where we expected to be. The mountain we had been calling Bryce, at the head of the Bush valley, was another peak altogether, and one that I had marked as "high peak" on the 1899 map. To the left of this lay Mount Forbes in the distance, whilst far away at the head of the south fork, rising from a great snow-field and glaciers, were the Freshfield group.



CAMP SCENE.

This explained why the Waitabit and the Bluewater creeks contained no glacier water; for the Bush river, and the Bush river alone, drained the whole area, from Mount Freshfield on the south, the back of Mount Forbes, and the western side of the whole Lyell ice-field to the north of the Columbia ice-field, which, splitting into several large glaciers, poured down in magnificent cascades of ice to the green pine woods that filled the valley below. And another point of considerable interest was the very low altitude of the valleys. At our camp at the forks of the Bush valley, just under the high peak we have named the Bush peak, we were only 2800 feet above sea-level, and looking up the north fork to the foot of the glaciers under Mount Columbia, the valley seemed to

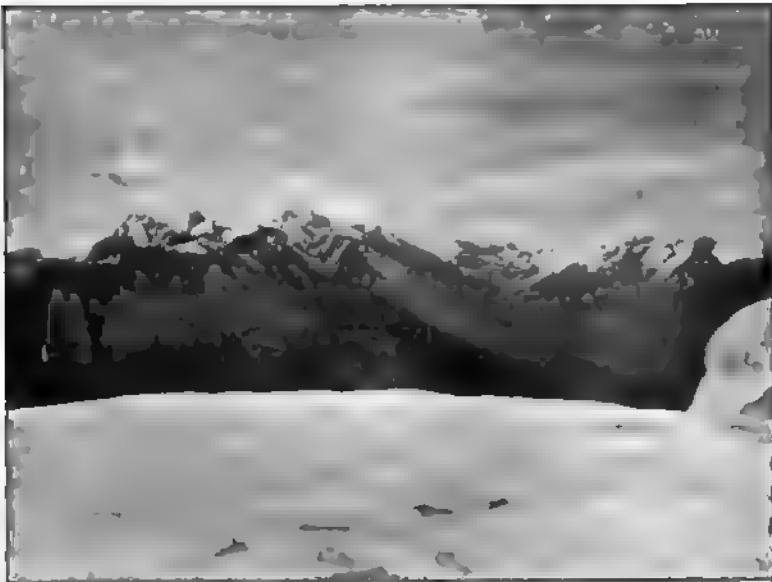
rise but little—certainly nothing near 1000 feet. This Bush valley is therefore by far the lowest of any valleys that lie directly under the highest peaks.

But with this discovery of where we were came the extremely unpleasant fact that the Columbia ice-field, which was our goal, lay nearly 15 miles away up a valley, every yard of which would have to be cut with an axe. If we had already taken ten days to do about 10 miles, probably we should take at least a fortnight to force our way to the head of the north fork. And with this reflection we returned to our camp in the valley, somewhat disheartened and sad, for our plans would have to be changed, and as far as we were concerned, the finest snow-peak in the Rockies, Mount Columbia, would not be climbed by us that year.

During the day Stephens and Lang had been cutting trail to the mouth of the north fork, and along this trail we started next day with the intention of going as far up the valley as possible. In a very short time we were forced down to the side of the river, over which we could not pass in the state of flood in which it was in. We might have spent the remainder of the day cutting through another half-mile or so of fallen timber, but we were all heartily sick of the work; so, turning our horses' heads straight up the hill, after a long day, we found ourselves at timber-line, and about 700 feet below the top of the mountain we had been up the day before. Stephens had some idea of working along the hillside high up near the limit of the trees; but, as it turned out, we could not possibly have taken the horses further, for great ribs of rock seamed the hillside further on, entirely barring the way.

We were now at a height of about 7300 feet, and out of the wet valley below—no mosquitoes or flies, and a magnificent view in almost every direction; so, next day being moderately fine, we again ascended to the top of the peak above the camp, photographed, surveyed, and mapped as much of the country as possible. Stutfield spent the morning looking for the goat, but without any result. But in the afternoon he successfully stalked some across a small valley to the west, and shot one of them. That evening it began to rain; it continued all the next day and night and the following day, finally, on the third night, turning into snow. On the morning of the 25th it stopped, but it was impossible to do anything, as the whole hillside was one sodden mass of melting snow. The magnificent effects of great masses of clouds rolling about in the Bush valley below, with an occasional gleam of sunshine, gave us hopes of better weather; but the clouds never cleared away from the high mountains, and on the 26th an attempt to climb a big peak that lay behind our camp was carried out in dense mist. The weather seemed going from bad to worse. Reluctantly we retraced our steps on the 27th back to the camp at the foot of the hill, where we had cached about half of our provisions.

Whilst we were at the high camp, I had noticed that on the south side of the Bush valley, at the head of a small creek, an obvious pass seemed to lead through the mountains straight to the head of the Blue-water creek and so to Donald, and I had hopes that perhaps we might find a short cut home by that route; also at the same time be able to investigate the mountains that lay between the Blaeberry creek and the Bush valley. On the 28th we started down the valley with the intention of making our way up this creek to the pass, but we were unable even to begin the ascent of the creek with the horses; the usual fallen timber lay piled even thicker than usual, and a canyon with precipitous sides would have forced us far up on to steep hillsides, where



THE BUSH PEAK.

horses would hardly have been capable of going. We camped on the banks of the stream, amongst some large timber.

The view down the Bush river to the foothills that shut off the valley from the greater valley of the Columbia was exceedingly fine. In the foreground water and shingle stretched in desolate fashion westward to where ridges of dark pine woods sloped down from dusky peaks above, sending out point after point to strengthen the forms of the middle distance; whilst beyond, far away across the Columbia, the Selkirk mountains raised their snow-peaks into a calm clear sky, a mysterious land unexplored and unknown. Through a rift in the clouds in the far west shone the setting sun, tinging the dull grey clouds overhead

and the stealthily flowing river below with its many-coloured fires. The great gnarled trunks of pine and fir, festooned with moss, fungi, and grey lichen, the dead and drooping branches, and the half-fallen decaying trunks propped up in dreary melancholy array, caught for a moment the sunset's ruddy glow, whilst the mysterious shadows of the dense forest behind darkened by contrast. A faint evening breeze softly moved the upper foliage, a couple of inquisitive chipmunks were chattering near at hand, and a small stream could be heard whispering amongst the thickets down by the bank of the main stream.

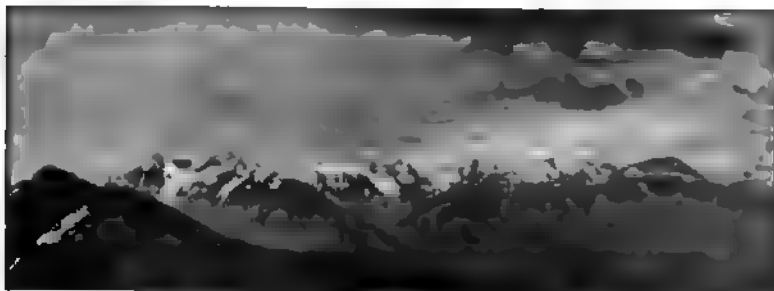
Such evenings compensate one for many a wet dreary day spent amongst the great mountains. Nature suddenly offers them to the traveller without any toil on his part. He has only to sit watching, surrounded by the dark forest, the stretch of waters, and the ever-changing glory of the sinking sun; then, unmindful of the worry of yesterday or the uncertainties of the morrow, amidst the great stillness he feels with absolute conviction one thing and one only—that it is a good thing to be alive and free. Civilized life no doubt teaches us much, but when one has once tasted the freedom of the wilds, a different kind of knowledge comes. The battling with storm, rain, cold, and sometimes hunger, and the doubt of what any day may bring forth, these at least teach that life, that mere existence, is beyond all price.

Next morning, August 29, we climbed a hill that lay about 4 miles back from the river and to the south. This was necessary in order to find out how the valleys ran, and how the peaks were situated in that part of the country west of the Freshfield range and south of the Bush river. It was one of the most tiring expeditions I have ever taken up a mountain. To start with, there was the usual fallen timber, rendered still worse by small undergrowth; then a steep hillside of several thousand feet, where we had to struggle hard for every foot gained. Pushed back by small bushes, stopped by huge logs, stifled by the hot moisture-laden air, we dragged ourselves up foot by foot till at last we shook ourselves free from the woods, and were able to easily finish the climb on firm rocks and in the open air. The main chain of the Rocky mountains was in cloud, but fortunately there were no high peaks to the south-east, south, and west, so I was able to complete my plane-table survey of that district. We then returned by a somewhat different route, hoping that it would be easier, but eventually found ourselves cut off from the camp by a large muskeg, the dangers of which, however, we disregarded, and, wading straight through it, got back to dinner.

Three days later saw us at Fish lake again, where we built a raft, and spent Sunday, September 2, catching and eating rainbow trout. On the following day we made great efforts to catch No. 2, the west-bound train, at Donald, so that we should reach the hotel at Glacier that evening. The west-bound train, "No. 2," finally arrived at about four o'clock in the morning.

Our trip was ended: of course one is never satisfied, and we should have liked to have done more. We had, however, found out nearly all we wanted to know about the geography of the district.

Practically, the whole district between the Wood river and the Blaeberry creek is drained by the Bush river; the Waitabit and Blue Water creeks merely take the water from the foothills. A large glacier exists at the back of the Freshfield group; this is the source of the south fork, whilst the Lyell and Columbia glaciers feed the north fork of the Bush river. Another system of glaciers that lie to the west of Mount Bryce feed two tributaries of the Bush river that flow southward and parallel with the north fork. The magnificent snow-capped peak, about 13,000 feet high, standing almost over the junction



THE SPENCER RANGE.

of the north and south forks is not Mount Bryce, as we had supposed, but is a new unnamed mountain. I think that, as it can be seen all the way up the Bush valley, it ought to be named the Bush peak. The great depth of the Bush valley is also of interest, and the fact that, to start with, both from Mount Freshfield and Mount Columbia, the valleys lie parallel with the main chain shows that probably the same forces that fashioned the valleys on the eastern side also made those on the west. This pressure, in many places at the headwaters of the Bush river, had contorted the rock into the most fantastic bends and loops. The strata sometimes would be perpendicular, and again within a few hundred yards twisted into S-shaped figures and crumpled forms. This contortion seemed general, and far more pronounced than anything that I have seen on the eastern side of the mountains. The general lie of the country was a series of more or less tilted strata facing north-east, with gentle slopes towards the south-west and precipitous faces towards the north-east, the ranges consisting chiefly of Carboniferous and Devonian limestones.

Prof. Bonney, F.R.S., has kindly examined one or two rocks that were brought home. In the bed of the Bush river there was a considerable amount of limestone with fossil corals in it. Prof. Bonney

describes it as follows: "It appears to belong to the genus *Lithostrotion*, and one at least is very like the *Martini* of Britain. This belongs to the Carboniferous limestone age." Another limestone: "Contains numerous fragments of organisms, but ill preserved, some, perhaps foraminiferæ, are like an ostreod, others probably mollusca." A third limestone: "The ground mass appears to retain traces of organisms and show signs of pressure. The round spots are puzzling; the mode of occurrence suggests oolitic grains, but they have a coarse granular structure—perhaps recrystallization has taken place."

There seems to be only one pass below timber-line connecting the Bush valley with the east side of the range. This I had seen when on the summit of Mount Athabasca. My friend Charles S. Thompson, of Chicago, explored the pass this summer by way of the west branch of the north fork of the Saskatchewan. As he is the first person who has been on its summit, I have called the pass Thompson pass. It is 6800 feet above sea-level, and below timber-line.

The question of passes and sources of rivers amongst the Canadian Rocky mountains is a most interesting one. On the Athabasca pass, a small tarn called the Committee's Punch Bowl drains both ways. Ross Cox gives an accurate description of it in the 'Fur Hunters of the Far West.' He says, "We reached what is called the great height of land. At this place a small circular basin of water 20 yards in diameter, dignified with the name of a lake, out of which flow two small creeks; the one discharges itself into Portage (*i.e.* Wood) river, that on the east joins the Athabasca. Prof. Coleman gives a similar description. Just south-east of the Athabasca pass lies Fortress lake, discovered by Prof. Coleman. This lake is about 8 miles long, and here the same thing happens. "The lake has a curious subterranean outlet in a tributary of the Chaba river, but sends most of its waters into the Wood river." *

Probably, if there were a lake on the summit of the Blaeberry, a similar state of affairs would be found, for the summit is quite flat, Dr. Hector's description being as follows: "The summit is wide and spacious, a few swampy streams flowing east, a little further on a small creek issuing from a number of springs flowing westward." When going west by the railway from Donald to Glacier House through the canyon that the Columbia has cut between Donald and Beaver Mouth, it seemed to me possible that centuries ago there had been a large lake filling the Columbia valley to the south from Donald to the upper lakes. This lake would again be reproduced if the canyon between Donald and Beaver Mouth were filled up for a height of less than 200 feet. Donald is 2530 feet, whilst the upper Columbia lake is 2700 feet. The south end of the upper Columbia lake is only cut off by about 2 miles of swamp from the Kootenay river. All along the

* Prof. A. P. Coleman, *Geographical Journal*, January, 1895, p. 58.

wide Columbia valley from Donald to the lakes are well-marked terraces of white calcareous mud, whilst at the bottom of the valley are a chain of great swamps. If the whole of this valley had at any time been a large lake, chiefly or wholly draining to the south,* it is quite likely that the Kootenay river, as it breaks into the wide valley just below the Columbia lakes from the north-east through a rocky gorge, would gradually have silted up the south end of the lake, so raising the height till at last a weak spot was found at the north end, and the whole drained away down the present valley of the Columbia. Moreover, if one looks at the direction in which the Spilimichene and the Shuswap creeks flow, it looks as if they at least were flowing into a river whose course was south, and not north. Now, if in former times this great lake had drained south, then the old headwaters of the Columbia were in the Bush river, and its source was amongst the great glaciers that sweep down from Mount Columbia and the Columbia ice-fields. Surely, for the birthplace of one of the most magnificent rivers of the West such a spot is more fitting than a swamp amongst the foothills! Surely its source should be where the huge snow-clad peaks rise high into the clouds, where the avalanche thunders, where the dark precipices keep guard over the valleys beneath, and where the Rocky mountains culminate in one great effort; for there, amidst ice and snow in the glacier caves, is born the Athabasca, that old river of the lonely northland; and there arise the rivulets that later become the mighty Saskatchewan!

Before the reading of the paper, Sir THOMAS HOLDICH, Vice-President, in the chair, said: Prof. Norman Collie is no stranger to you. It is not so very long ago that he told us of his adventures in 1897-98, and now he will again take us into the untravelled paths of the Rockies, north of the Canadian Pacific railway, and I am sure will give us a most interesting paper about that country.

After the reading of the paper, the following discussion took place:—

Sir THOMAS HOLDICH: *Aprpos* of this interesting paper, a letter has been received from Mr. Whympers, the well-known mountaineer and explorer of American mountains, which, with your permission, I will read to you.

"I regret that I cannot be present at the reading of Dr. Collie's paper on the 14th inst. I have just returned from a run over the Canadian Pacific railway, and have twice passed within sight of the slopes where his journey commenced, and saw a fair sample of the forest through which he had to make his way.

"The whole continent was under snow, from 6 inches to 3 feet deep, and this rendered the extraordinarily intricate interlacement of the fallen trunks more apparent than it is in the summer-time. It was obvious that no beasts of burden could be led or driven through such a tangled mass of timber without a way being prepared for them, and it appeared to me that progress might easily be reduced to a mile per day. The ranges, which are traversed from east to west by the Canadian

* Compare G. M. Dawson, "Preliminary Report on the Physical and Geological Features of that Portion of the Rocky Mountains between lats. 49° and 51° 30'," Part B, 'Annual Report,' 1885, pp. 28-32.

Pacific railway, are more than twice the length of Switzerland, and throughout the greater part of this distance the lower slopes of the mountains are covered with dead forest, which must be penetrated somehow by any one who aspires to higher ground. The difficulties commence sometimes within a few hundred feet of the line. The managers of the railway are well aware that paths are wanted. Already a good many have been made, or trails have been cut in the vicinity of some of the most attractive points on the line, and many more are contemplated.

"Anything that Dr. Collie can say respecting the temperatures he experienced at the highest points he has gained in the Canadian Rockies will be welcome, for there are very few recorded observations. It is generally said, and it seems to be the fact, that *in the winter*, in the Canadian Rockies, at the height of 5000 feet above the sea, temperature is higher than it is upon the prairies, more than 3000 feet lower down. Anyhow, in the principal street of Moose Jaw (1725 feet), I saw on November 21 last, at 11 a.m., a large thermometer on the sunny side of the street *with the sun shining on its bulb*, and the spirit standing at 5° Fahr. ; while on the following day, at the same hour, when more than 3000 feet higher, temperature was only a few degrees below freezing-point. This inversion of the usual order of things is not uncommon in other parts of the world *in winter*, but does it also occur in the summer ?"

That is a question I shall leave to Prof. Norman Collie.

MR. STUTFIELD : You will gather, from Prof. Norman Collie's paper, that travel on the western side of the Rockies, especially in the Bush river, is not altogether an unmixed joy ; you will also gather that we were not so successful as we had hoped to be, owing to the weather and also to a circumstance which he omitted to mention, the worst bit of luck that befell us. By an unfortunate accident at the beginning of the expedition, a horse falling back, we lost our best axeman. Owing to this accident, we spent four or five extra days going up the valley. As Dr. Collie told you, I am largely responsible for having brought him to the Bush river. After our trip in '98 I made inquiries, and we thought the route seemed feasible. I am responsible for taking the west side of the mountains, but I am not responsible for the weather and for the maps being entirely wrong. As, however, Dr. Collie was afforded the opportunity of putting the maps right, our trouble was not entirely wasted. You have heard what made the journey so difficult. Timber we anticipated, but the tremendous amount of tangled undergrowth was entirely different from that on the eastern side of the Rockies ; logs piled on logs, the very soil seemed composed of rotting tree-trunks and decaying vegetable matter, and if the bottom of the valley was wide, the swamps on each side gave forth a reeking mist every morning which chilled one to the bone ; but worst of all were the mosquitoes. It was even a pleasure to reach our high camp, where we lived for seven days in fog and snow and slush, and only once saw the mountain-tops. The sun was going down, the clouds drifted together, and we had the finest scenic effect I have ever seen in the mountains—peak after peak opened out, lit up by the pale saffron glow ; in fact, all our hardships were counterbalanced by the beauty of that scenery. To see the Rocky mountains properly, you must climb some peak, whence you will see a wilderness of mountains. You cannot, of course, see a tenth or a hundredth part of them, but in imagination you can see them stretching away hundreds of miles to the north and south and westwards to the Pacific. I don't think there is any other country in the world with the same wonderful panorama of mountains. Having regard to the beauties of the country, I think it ought to be better known than it is, and two years ago I prophesied that in the course of some years' time the Canadian Rockies would be the playground of America, as Switzerland is for Europe. A good deal has been done towards the fulfilment of

this prophecy. The Canadian Pacific railway have placed guides in various places, and soon we shall hear of mountains hitherto deemed inaccessible being regarded as easy trips for a lady. Two days ago I received a copy of a local journal with an account of our journey written by our cook, and I notice the rival organ sneered at the mention of scenery. It seems out West they have little appreciation of natural beauties, and, in spite of the general cuteness of the American mind, they have yet to learn the commercial value of scenery. In the Rockies they must live on scenery for some time to come. After all, the Swiss have been living on it for a long time, and they have grown pretty fat. Very few minerals of any value have been found so far. The chief wealth of the country lies in its scenery, and I feel quite confident that our playground is destined to afford recreation and profit for many thousands in the not far distant future.

Mr. G. P. BAKER: I feel that you will all agree that there must be an extraordinary fascination in mountain exploration to entice such men as Prof. Collie, with a comparatively limited holiday at their disposal, to travel from 5000 to 6000 miles to reach the region of these Rockies, which he has so well described and so beautifully illustrated. Some of you would, perhaps, hardly think the game worth the candle; but, as one of his early companions, I may say I was perfectly satisfied, speaking from the mountaineer's point of view. Collie has done very much to open up the country on the eastern slopes of the range. Two years ago Mr. Stutfield prophesied that the north fork of the Saskatchewan would be joined by paths—that, in fact, it would be the Zermatt of the country. Everything tends to this end, and already the Canadian Pacific railway authorities have cut a pony-path to the Bow lake. Last year the railway authorities had introduced seven Swiss guides. They take them over in May, returning them in October and during the summer months. I understand they have guided some 1700 tourists among the mountains and glaciers. I quite agree with Mr. Stutfield that the time is not far distant when these Alps will become the playground of the American continent.

Prof. NORMAN COLLIE: I have to thank you for the very kind way in which you have listened to me. With regard to the temperature of the Canadian Rocky Mountains, I don't think the temperature in August is different from that in any other mountainous land at the same latitude; the days are warm, and occasionally the nights are cold, exactly as one expects it to be. I should like, also, to thank the Geographical Society for having kindly lent me a Watkins barometer to take with me to the mountains. I must say I found it useful; it was very light and easily carried, and if it were always correct it would be perfect, but the one I had certainly went wrong, and I should not have discovered this had I not had a mercurial barometer with me. It went as much as $\frac{3}{10}$ inch out. On arrival home I left it in my laboratory for a month, and it finally went $\frac{1}{2}$ inch out. I then brought it back here, when it was returned to the makers, who put it right, but after a month it went $\frac{1}{2}$ an inch out again; it was then left to itself, and proceeded to get right again. Now, such an instrument must be carefully watched. I should be pleased to take it out again, but I should like to have a mercurial one to check it with.

There is one thing more I should like to say. Since the paper I have just read was printed, I have found that my suggestion, that the present source of the Columbia river is not the original source, is not novel. In the Annual Report (Part B, 1885) of the Geological and Natural History Survey of Canada, Dr. Dawson has already drawn attention to "the present condition of the valley of the Columbia in regard to its drainage being both peculiar and anomalous." He also refers to "the Columbia-Kootenay valley as an orographic feature

of the first importance;" then he points out that undoubtedly at one period the present Columbia valley, from the upper Columbia lake to the mouth of the Kicking Horse, drained southwards; saying that, "regarded as a whole, the valley is widest in its southern part, and this constitutes one argument in favour of its original southern outflow." In his description of the detrital deposits which now fill up the floor of the valley, he writes, "In a number of places, collections of irregular mounds and ridges occur, which are certainly morainic in character. . . . These, with frequent intercalations of sand and gravel, are largely composed of fine pale silts. . . . It would thus appear that the origin of the Columbia-Kootenay depression must be sought at a remote period of great or very long-continued erosion subsequent to the era of mountain elevation at the close of the Laramie, and the facts are in favour of the belief that the river producing it flowed to the southward. . . . In later Tertiary times, and during the Glacial period, a portion of the ice accumulating on the adjacent ranges discharged southward by this valley. On the withdrawal of this great glacier, morainic accumulations were formed along its retreating edge, and by smaller glaciers at the mouths of the lateral valleys. At this time, or not long thereafter, owing to some combination of circumstances, . . . the valley was flooded to a considerable depth, and the white silt deposits—the material of which was directly due to the action of glaciers still existing in the neighbouring mountains—were laid down." Even after this period, Dr. Dawson is of the opinion that the valley drained to the south. Later, however, he says, "the great quantities of coarse detritus brought in by the lateral streams would have a tendency, by interrupting this flow at various points, to produce a series of long lakes. The actual exceptionally slight slope of the portion of the valley occupied by the Columbia, however, with the fact that the flow is now northward instead of to the south, favour the belief that a change in level occurred, by which the northern part of the district was relatively lowered, and that this, in conjunction with the great deposit formed by the Kootenay at the place at which it enters the valley, determined the present position of the watershed between the two streams, and reversed the direction of flow in that part of the valley now occupied by the Columbia."

Sir THOMAS HOLDICH: Since the days when Pallisser and Hector first unfolded to us the majesty of the Rocky mountain scenery, we have had many travellers in that direction, notably Coleman, who first displaced Mounts Brown and Hooker from the position they held for so many years as the highest mountains in Northern Canada. Subsequently we had Green and Wilcox, who introduced us to mountain scenery south of that line, and the Government surveys of part of the country. But the Government cannot deal with more of the country than promises well for economical development, so there still remains a vast area of playground for future enterprising travellers. The reasons why this land has been slow in the opening process have been indicated to us to-night by Prof. Norman Collie. I take it that the "devil's scrub" is one of them and the mosquitoes another, although it seems that the mosquitoes happily proved to be of a non-malarious order. Now I must ask you to join me in offering a cordial vote of thanks to Prof. Norman Collie, and to congratulate him on the exceeding beauty of his illustrations.

A BATHYMETRICAL SURVEY OF THE FRESH-WATER LOCHS OF SCOTLAND.*

By Sir JOHN MURRAY, K.C.B., D.Sc., F.R.S., and the late FRED. P. PULLAR, F.R.G.S., F.R.S.E.

PART II.—THE REMAINING LOCHS OF THE FORTH BASIN.

INTRODUCTION.

Part I. of this work, dealing with the lochs of the Trossachs and Callander district, viz. Lochs Katrine, Arklet, Achray, Vennachar, Drunkie, Lubnaig, Voil, and Doine, was published in this Journal in April, 1900. This second part treats of the remaining lochs of the drainage basin of the Forth, viz. Loch Chon, with Lochan Dubh, Loch Ard, and Lake of Menteith in Perthshire, and Loch Leven in Kinrossshire. The methods and apparatus used were the same as those described in Part I., all the soundings having been taken from rowing-boats with the F. P. Pullar sounding-machine.

MAPS AND ILLUSTRATIONS.

The general map of the district published in Part I. includes the lochs now treated of, except Loch Leven. The four maps illustrating this part show the depths in each of the lochs under consideration, on the scale of 3 inches to the mile (1 : 21,120), most of the soundings taken during the survey being given in feet. The intervals between the contour-lines of depth are indicated by different shades of blue, and the intervals between the contour-lines of height of the neighbouring country by shades of brown.

Plate I. shows Loch Chon with Lochan Dubh, the contour-lines of depth being drawn in at 25, 50, and 75 feet.

Plate II. shows Loch Ard, the contour-lines of depth being drawn in at 25, 50, 75, and 100 feet.

Plate III. shows Lake of Menteith, the contour-lines of depth being drawn in at 10, 25, 50, and 75 feet.

Plate IV. shows Loch Leven, the contour-lines of depth being drawn in at 10, 20, 50, 70, and 80 feet.

In addition to the maps, there are four woodcuts in the text, illustrating the character of the scenery around the lochs.

DEPTHS OF THE LOCHS.

Loch Chon.—There are two lochs in Perthshire bearing this name, the one a little loch in the parish of Blair Atholl. The Loch Chon now under consideration lies to the south of Loch Katrine, and trends in a

* Continued from vol. xv. p. 352. Maps, p. 332.

north-west and south-east direction. It lies at a height of 296 feet above sea-level, and the river into which it flows expands, a little distance to the south-east, into a small loch, Lochan Dubh or Loch Dhu, the surface of which is 10 feet lower. Loch Chon is over $1\frac{2}{3}$ miles in length, and the greatest width is about one-third of a mile. The mean breadth, obtained by dividing the area of the loch by its length, is a quarter of a mile, being 15 per cent. of the length. Its waters cover an area of about 277 acres, or less than half a square mile, and it drains an area about $14\frac{1}{2}$ times greater, or nearly 4000 acres (nearly $6\frac{1}{4}$ square miles). The number of soundings taken in Loch Chon was 157, the greatest depth observed being 75 feet. The mass of water contained in the loch is estimated at 358,000,000 cubic feet, and the mean depth



LOCH CHON.

(From a photo by G. W. Wilson.)

at over 29 feet, or 39 per cent. of the maximum depth. The length of the loch is 120 times the maximum depth, and 305 times the mean depth.

Loch Chon is irregular in outline, and the contour-lines are also irregular. The deepest part of the loch (*i.e.* exceeding 50 feet) forms a long narrow depression, situated approximately in the centre of the loch, but closer to the western than to the eastern shore, about seven-twelfths of a mile in length, with a maximum width of over one-sixth of a mile. The maximum depth, 75 feet, was found comparatively very close to the western shore, being in fact only about 130 yards distant; this gives a slope of almost 1 in 5, and a similar steep slope is indicated by the near approach to the shore of the contour-lines for a considerable distance along the western side of the loch. The slope from the eastern shore is, generally speaking, more gradual. The 25-foot depression is

divided into two portions by the rising of the floor of the loch about a quarter of a mile from the southern end. The maximum depth in the smaller southern depression is 49 feet. The larger 25-foot depression, separated from the smaller one by an interval of about one-eighth of a mile, is over $1\frac{1}{4}$ miles in length, approaching close to the north-western end of the loch, with a maximum breadth of three-eighths of a mile. This larger depression is very irregular in outline, occupying nearly the full width of the loch towards the centre, while a short distance farther south there is a narrow constriction in the vicinity of the Heron islands.

The area of the bottom between the shore-line and the 25-foot contour is about 119 acres, or 43 per cent. of the total area of the loch; that between the 25- and 50-foot contours is about 127 acres, or 46 per cent.; and that deeper than 50 feet is about 32 acres, or 11 per cent.

Lochan Dubh.—This little basin is one-fifth of a mile in length, and less than one-sixth of a mile in maximum width. Its waters cover an area of about $11\frac{1}{2}$ acres, and it drains an area eighteen times greater, or about 205 acres. The mean breadth is less than one-tenth of a mile, or 45 per cent. of the length. Twenty-five soundings were taken in Lochan Dubh, the maximum depth observed being 41 feet. The cubic mass of water is estimated at 586,000 cubic feet, and the mean depth at nearly 21 feet, or 50 per cent. of the maximum depth. The length of the loch is 28 times the maximum depth, and 56 times the mean depth.

Lochan Dubh is very simple in construction, shoaling on all sides down to the deepest part. As in Loch Chon, the slope seems to be much steeper off the western than the eastern shore, a cast of 35 feet having been taken comparatively very close to the west side. The water shallows where the loch narrows a little above the outlet, a depth of $8\frac{1}{2}$ feet being found where the bottom is covered with reeds. The area of the bottom between the shore and the 25-foot contour-line is about 7 acres, or 60 per cent. of the area of the loch, and that deeper than 25 feet is nearly 5 acres, or 40 per cent.

Loch Ard.—Loch Ard receives the outflow from Lochan Dubh and Loch Chon; it trends in an east and west direction, sending out one prolongation to the south and another to the east. Its level is 105 feet above the sea. It is over 3 miles in extreme length, including the eastern prolongation, but the body of what may be called the loch proper is about $2\frac{1}{3}$ miles in length, from the head of the loch to Helen's Rock. The greatest width, measured from the extremity of the southern prolongation to the northern shore of the loch, is over 1 mile, the mean breadth being two-fifths of a mile. Its waters cover an area of over 600 acres (nearly 1 square mile), and it drains an area more than ten times greater, or about 6250 acres ($9\frac{1}{4}$ square miles). The number of soundings taken in Loch Ard was 308, the maximum depth being 107 feet. The cubic mass of water contained in the loch is estimated at

1,150,000,000 cubic feet, and the mean depth at nearly 44 feet, or 41 per cent. of the maximum depth. The length of the loch is 113 times the maximum depth, and 277 times the mean depth.

Loch Ard proper forms a comparatively simple basin, shoaling from the shores down to the deepest part. The 100-foot depression occupies a central position, and is about three-quarters of a mile in length. The 75-foot depression is over $1\frac{1}{4}$ miles in length, while the principal 50-foot depression, over $1\frac{1}{2}$ miles in length, is separated by a very short interval from a small detached area in the north-western part of the loch at Kinlochard, in which the depth exceeds 50 feet. The 25-foot contour-line is very irregular, and there are four isolated patches in which the



LOCH ARD, WITH BEN LOMOND IN THE DISTANCE.

(From a photo by J. Valentine.)

depth exceeds 25 feet: the largest one in the southern prolongation at Couligartan has a maximum depth of 39 feet; a second small area occurs between the southern prolongation and the island of Eilean Gorm, in which the maximum depth is 35 feet; the other two areas are situated in the eastern prolongation of the loch, the maximum depth in the eastmost depression near the outlet of the loch being 33 feet, and in the other 39 feet. The soundings taken between Duke Murdoch's Castle and Briedach show that the bottom is very irregular; the first sounding gave a depth of 17 feet, followed by 44 feet, then 38 feet, then 23 feet, then 31 feet, the bottom rising on approaching the elevation on which Briedach and a beacon are situated.

The area of the bottom between the shore and the 25-foot contour-line is about 240 acres, or 40 per cent. of the area of the loch; that

between the 25- and 50-foot contours is about 154 acres, or 25 per cent.; that between the 50- and 75-foot contours is nearly 64 acres, or 11 per cent.; that between the 75- and 100-foot contour-lines is about 78 acres, or 13 per cent.; and that deeper than 100 feet is nearly 65 acres, or 11 per cent.

Lake of Menteith.—The Lake of Menteith resembles Loch Leven somewhat in outline, and in being relatively a very shallow basin. It is also historically related with Loch Leven, since Queen Mary at one time lived within their precincts; the ruins of the Priory on Inchmahome, in which she resided before her removal to France, are of great architectural beauty and antiquarian interest. Its surface is only 55



LAKE OF MENTEITH.

(From a photo by G. W. Wilson.)

feet above the sea. Its maximum length is over $1\frac{1}{2}$ miles, and the maximum width over 1 mile, the mean width being five-eighths of a mile. Its waters cover an area of 652 acres (over 1 square mile), and it drains an area $6\frac{1}{2}$ times greater, or over 4000 acres (nearly $6\frac{1}{2}$ square miles). The number of soundings taken in the Lake of Menteith was 375, the maximum depth being 77 feet. The cubic mass of water contained in the loch is estimated at 562,000,000 cubic feet, and the mean depth at $19\frac{3}{4}$ feet, or 28 per cent. of the maximum depth. The length of the loch is 110 times the maximum depth, and 427 times the mean depth.

The bottom of the Lake of Menteith is apparently very irregular. The 10-foot line follows approximately the outline of the loch, except that it is considerably removed from the south and south-east shores,

where the land is bordered by reeds; it also surrounds the islands of Inchmahome, on which the Priory is situated, and Inch Talla, on which the castle is situated, Dog isle, and a submerged crannog covered by 4 feet of water in the north-eastern angle of the loch at Port of Menteith. The area of the bottom covered by more than 25 feet of water is cut up into three portions. The eastmost of these 25-foot depressions has a maximum depth of 48 feet; the central 25-foot depression is almost triangular in outline, with a maximum depth of 49 feet. The westmost 25-foot depression is the largest and deepest; it is almost divided into two halves by a narrow constriction between Inch Talla and Stable point, the deepest water observed in the southern half being 49 feet, while the northern half contains the deepest water found in the loch. Here the bottom falls below the depth of 50 feet over an area of nearly 32 acres, the 50-foot depression being about a third of a mile in length and over a sixth of a mile in maximum width. It encloses a small patch in which depths of 75, 76, and 77 feet were observed—the maximum depth of the lake—situated comparatively close to the northern shore at Coilledon.

The area of the bottom between the shore and the 10-foot line is about 22 acres, or 34 per cent. of the whole area of the loch; that between the 10- and 25-foot contours is about 255 acres, or 39 per cent.; that between the 25- and 50-foot contours is about 142 acres, or 22 per cent.; and that over 50 feet nearly 32 acres, or 5 per cent.

Loch Leven.—Loch Leven has long been famous for its trout. In the ‘Old Statistical Account of Scotland’* we read: “The high flavour and bright red colour of the trout seem evidently to arise from the food which Nature has provided for them in the loch. What appears to contribute most to the redness and rich taste of the Loch Leven trout is the vast quantity of a small shellfish, red in its colour, which abounds all over the bottom of the loch, especially among the aquatic weeds. The trout when caught have often their stomachs full of them.”

About the year 1770 the trout brought about a halfpenny each, large and small, and perch a halfpenny per dozen. Some years later the price was doubled, and towards the end of the century the trout were sold at 4*d.* per lb., pike 2*d.* per lb., and perch 2*d.* per dozen. In 1845 two boats and four boatmen were employed during part of the fishing season, while in 1891 there were twenty-two boats on the loch for the use of anglers. Extensive operations for the draining of the loch were completed about the year 1845 at a cost of £40,000, by which the loch was lowered 4½ feet, and the area reduced by about 1400 acres; some people maintain that the quality of the trout has been injuriously affected by the draining. Prior to 1856 rod fishing was disappointing, but about that time, from some cause that does not appear to have been

* Vol. vii. pp. 166, 168. 1793.

satisfactorily explained, the fish rose more freely to the bait, angling became more encouraging, and Loch Leven became a resort for anglers from all parts of the country. Some years ago the fishing was taken over by the Loch Leven Angling Association, Limited, who pay a rental of £1000 per annum. The statistics regarding the trout caught by rod in the loch, and their weight, show great fluctuations from season to season. In 1872 over 17,000 were taken, the average weight being nearly 1 lb.; in 1873 the take fell to 13,400, in 1874 to 6400, in 1875 to 5000, and in 1876 even less. In 1877 the take rose again to 6000, in 1878 to 13,000, and in 1879 to 21,000, but the average weight seems to have been less. The best year recorded during the last quarter of a century was in 1888, when 23,516 trout were taken weighing 21,074 lbs. In 1893, 1898, 1899, and 1900 the takes again exceeded 20,000, but the weight never equalled the 21,000 lbs. of 1888, the nearest approach being in 1893, when 23,100 trout weighing 19,500 lbs. were caught. Last year (1900) the trout taken by the rod numbered 23,811, weighing 15,584 lbs., an average of 0.654 lb.

Perch are also abundant, and pike are not uncommon. Formerly charr were frequently taken, but they appear to have become scarce in recent years. The American weed (*Elodea canadensis*) appears to have become firmly established in certain parts of the loch, and is causing a great deal of trouble, all the means hitherto tried for the purpose of destroying it being only of temporary benefit.

On St. Serf's island (which is about 80 acres in extent) are the remains of a priory dedicated to St. Serf, said to have been founded by a Pictish king, and given to the Culdees. The castle (on Castle island, which has an area of about 5 acres) is said to have been founded by Congal, son of Dongart, king of the Picts. It is famous in history as the prison in which the unfortunate Queen Mary was incarcerated for eleven months, and from which she effected her romantic escape.

Considering the area covered by the waters of Loch Leven, it is an extremely shallow loch, its mean depth being less than that of any other loch hitherto examined by us. When measured by the Ordnance Survey officers in August, 1893, its surface was found to be 349.6 feet above the level of the sea. In form it is somewhat pear-shaped, the greatest length being $3\frac{2}{3}$ miles from south-east to north-west, and the greatest width is about $2\frac{2}{3}$ miles. The mean width is nearly $1\frac{1}{2}$ miles, being 40 per cent. of the length. Its waters cover an area of nearly 3400 acres ($5\frac{1}{3}$ square miles), and it drains an area nearly ten times greater, or about 32,500 acres (nearly 51 square miles). The number of soundings taken in Loch Leven was 538, the maximum depth being 83 feet. The bulk of water contained in the loch is estimated at 2,195,000,000 cubic feet, and the mean depth at less than 15 feet, being 18 per cent. of the maximum depth. The length of the loch is 232 times the maximum depth, and 1296 times the mean depth.

An examination of the map shows how uneven the bottom of Loch Leven is. The deepest part of the loch is cut up into two portions, the larger depression lying to the west and south of St. Serf's Island, with a maximum depth of 83 feet—the greatest depth observed in the loch—the smaller depression being situated in the north-western part of the basin, and attaining a maximum depth of 79 feet. The larger 70-foot depression lies to the west of St. Serf, with two isolated soundings of 70 feet farther to the south-east; the smaller 70-foot depression is in the north-western part of the loch, with an isolated sounding of 71 feet. The larger 50-foot depression to the south and west of St. Serf is nearly a mile in length, while the smaller in the north-western portion of the basin is a little over half a mile in length. The larger 20-foot



LOCH LEVEN AND CASTLE.

(From a photo by J. Valentine.)

depression is very irregular in outline, extending from near the outlet of the loch at the river Leven along the southern and western shores of St. Serf, and sending a wide branch in a westerly direction and another in a north-westerly direction towards Castle Island, with an extreme length of about 2 miles. It is separated by an interval of about half a mile (in which the bottom rises in a pear-shaped elevation—a sunken island—covered by 5 to 9 feet of water) from the north-western 20-foot depression, which is apparently extremely regular in outline, being about two-thirds of a mile in length, and over one-third of a mile in maximum width. The 10-foot line follows approximately the contour of the loch, except off the eastern shore to the north of St. Serf, where the 10-foot line runs on an average nearly three-

quarters of a mile distant from the shore. The 10-foot line also surrounds Reed Bower, Castle Island, and Soart Island, and in addition to the elevation in the central part of the loch already mentioned, there is another small elevation covered by depths of 3 to 7 feet near the southern shore off Waterbutts Plantation.

The area of the bottom between the shore and the 10-foot contour-line is about 1430 acres, or 42 per cent. of the whole area of the loch; that between the 10- and 20-foot contours is nearly 1450 acres, or 43 per cent.; that between 20 and 50 feet is about 375 acres, or 11 per cent.; that between 50 and 70 feet is nearly 110 acres, or 3 per cent.; and that over 70 feet is about 25 acres, or 1 per cent. It will thus be seen that no less than 85 per cent. of the bottom is covered by less than 20 feet of water, and the mean depth, as already mentioned, is less than 15 feet.

[The details regarding the physical features of the different lochs are collected together in the table on p. 282 for convenience of reference.]

DEPOSITS.

The general character and composition of the muds from the lochs under consideration do not differ from what was described in Part I. The mineral species are the same as there enumerated, and are nearly always angular. The muds contain no carbonate of lime; oxide of iron is present in them all, but appears to be in greater abundance in the Loch Chon samples.

Three brown muds were examined from Loch Chon, from depths of 10 feet, 14 feet, and 37 feet. The colour was lighter, and the mineral particles were more abundant and larger, in the shallower water. In the deposit from 10 feet the mineral particles made up probably 35 to 40 per cent., and included a few rock fragments which sometimes attained a diameter of 10 mm., the mean diameter of the mineral particles exceeding 0·05 mm. in diameter being about 0·3 mm., while in the deposit from 37 feet the percentage falls to about 10, with a mean diameter of 0·1 mm. Inversely, clayey matter and vegetable matter were more abundant in the deeper water, mixed with minute mineral particles, impregnated with ferric oxide, and containing diatoms, sponge spicules, arenaceous foraminifera, and entomostracous skeletal fragments.

A sample from the deepest part of Loch Ard was a dark-grey mud, consisting principally of vegetable and clayey matter, the mineral particles not exceeding 10 per cent., with a mean diameter of about 0·1 mm. The organic remains observed were the same as in Loch Chon.

A fine-grained dark-brown mud from a depth of 60 feet in Loch Leven contained probably not more than 5 per cent. of mineral particles

A BATHYMETRICAL SURVEY OF

Loch.	Elevation of surface above the sea.	Number of soundings.	Length.		Breadth, miles.		Mean breadth per cent. of length.	Depth.		Ratio of depth to length.		Volume, million cubic feet.	Area of loch.	Drainage area.	
			Miles.	Max.	Mean.	Max.		Mean.							
									Feet.	Max.	Mean.				
													Feet.	Max.	Mean.	Square miles.	Total in square miles.	Ratio to area of loch.
Chon ...	296	157	1.7	0.3	0.25	14.7	75	29.382	39.2	120	305	358	0.43	6.21	14.44
Lochan Dubh	286	25	0.2	0.12	0.09	45.0	41	20.700	50.5	28	56	0.6	0.018	0.32	17.77
Ard ...	105	308	2.3	1.1	0.41	17.8	107	48.863	41.0	113	277	1150	0.94	9.76	10.38
Lake of Men- teith ...	55	375	1.6	1.0	0.64	40.0	77	19.770	25.7	110	427	562	1.02	6.35	6.23
Leven ...	350	538	3.65	2.6	1.45	39.7	83	14.869	17.9	232	1296	2195	5.30	50.92	9.61
		1403										4265.6	7.708	73.56	9.54

exceeding 0·05 mm. in diameter, the bulk of the deposit consisting of clayey and vegetable matter, containing many beautiful diatoms, with sponge spicules and entomostracan remains.

TEMPERATURE OBSERVATIONS.

The serial temperature observations taken in the lochs under consideration are given in the following table, but many temperature observations were taken at the surface which are not, of course, included in the table :—

Depth in feet.	Loch Chon.	Lochan Dubh.	Loch Ard.		Lake of Menteth.	Loch Leven.		
	May 15, 1900.	May 15, 1900.	Aug. 6, 1899.	May 16, 1900.	May 14, 1900.	June 11, 1900.	June 22, 1900.	Sept. 1, 1900.
0	51·8	54·7	63·0	51·7	51·3	58·7	62·3	58·0
5	—	—	—	—	—	58·4	62·2	—
6	50·7	51·1	61·3	51·4	51·1	—	—	—
10	—	—	—	—	—	58·0	62·1	—
12	—	—	61·3	50·5	—	—	—	—
18	—	—	61·3	48·5	—	—	—	—
20	49·5	—	—	—	50·7	57·5	—	—
24	—	—	61·2	48·3	—	—	—	—
30	—	—	60·5	47·7	—	57·4	61·5	—
35	—	47·6	—	—	—	—	—	—
40	48·6	—	—	—	50·5	56·6	—	—
48	—	—	50·1	47·1	—	—	—	—
50	—	—	—	—	—	56·5	59·3	57·3
60	48·5	—	48·2	46·9	50·2	56·3	56·8	56·6
70	—	—	—	—	—	—	56·2	56·6
76	—	—	—	—	—	—	—	—
90	—	—	47·5	46·5	—	—	—	—
96	—	—	47·5	46·5	—	—	—	—
100	—	—	—	46·4	—	—	—	—

Loch Chon and Lochan Dubh.—These lochs were sounded on May 15, 1900, when the surface temperature in Loch Chon varied between 51·8° and 54·5°; below the surface the temperature decreased gradually down to 48·5° at 60 feet, so that the range observed throughout the whole body of water was only about 6°. In Lochan Dubh the surface temperature was slightly higher than in Loch Chon (54·7°), while the temperature of the deeper water was observed to be about 1° lower (47·6°), so that in the small body of water contained in Lochan Dubh the range was greater than in the larger Loch Chon, viz. 7°.

Loch Ard.—Loch Ard was visited on August 5 and 6, 1899, and again on May 16, 1900. The highest surface temperature (64·6°) was observed in the southern prolongation of the loch in August, the maximum temperature observed at the same time in the body of the loch proper being 63°. It will be seen that the whole body of water was warmer in August, and that a drop of 10° was recorded between the

depths of 30 and 50 feet, the extreme range of temperature from surface to bottom being 17° . No steep gradient was observed in May, the temperature decreasing gradually from top to bottom, the extreme range observed in May being 8.7° .

Lake of Menteith.—The Lake of Menteith was visited on August 7, 1899, and May 14, 1900. No serials were taken in August, when the surface temperature varied only from 62.2° to 63.2° . In May the surface temperature varied from 51.1° to 52.2° , and the temperature decreased gradually from surface to bottom, the range observed in May throughout the whole body of water being only 2° —from 50.2° to 52.2° ; the extreme range shown by all the observations amounts to 13° .

Loch Leven.—Loch Leven * was sounded on June 11, 12, and 22, 1900, and again on September 1 and October 23. A reading at the surface on June 11, at 5 p.m., gave 58.7° , and on June 12, at 4.50 p.m., a temperature of 67.5° was observed—a range of nearly 9° in one day. This reading of 67.5° may be specially referred to as being, so far as we are aware, the highest temperature hitherto recorded in the waters of Scottish lochs, the next highest reading being one of 65° observed by Mr. Scott at the surface of Loch Oich in August, 1897. In September the surface temperature ranged only from 57° to 58.5° . We are doubtful as to the working of the thermometer made use of in the October visit, and the readings have therefore not been included in the table.

The serials taken in June indicate the rapidity with which the waters of a shallow lake like Loch Leven become heated up in summer. During the eleven days between June 11 and 22 the whole body of water had acquired a higher temperature, amounting to about 4° in the upper layers down to 30 feet, to nearly 3° at 50 feet, and to half a degree at 60 feet. Thus, while the body of water in a shallow lake absorbs heat more rapidly than that in a deep lake, it also loses heat more rapidly, and therefore the quantity of heat stored up in the waters of a deep lake may not be less than that stored up in the waters of a shallow lake, as Delebecque† seems to think. From a preliminary study of our temperature observations in the Scottish lochs we believe the reverse to be the case. For instance, Loch Katrine and Loch Leven are comparable as regards superficial area, but Loch Katrine is six times as deep as Loch Leven, and contains twelve times as much water; if the temperature of the water in the two lochs were taken simultaneously before and after a definite interval in summer, it seems probable that, while the temperature in Loch Leven might have been

* We understand that the temperature of the water of Loch Leven has been taken at the pier once a day (at 12 noon) during the five months of the fishing season for the past twenty-five years, but we have had no opportunity of examining the observations.

† “La quantité totale de chaleur emmagasinée dans un lac variera d'autant moins que ce volume sera plus grand par rapport à cette surface” (‘Les Lacs français,’ p. 150).

raised much higher than in Loch Katrine, the amount of heat stored up, as represented by the number of cubic feet raised 1° , would be found to be greater in Loch Katrine than in Loch Leven, and that the difference would bear some relation to the ratio between the bulk of water and the area of surface exposed to the rays of the sun. We shall endeavour to work this matter out in greater detail as our temperature observations accumulate, and we may return to the subject in a later paper.

PELAGIC AND OTHER ORGANISMS.

The tow-net collections taken in the lochs now under consideration have not yet been worked up, and we therefore limit our remarks in this paper to the results obtained by Mr. Scott in Loch Leven in 1890, 1897, and 1898.*

In June, 1890, Mr. Scott found the fauna to be abundant and varied—Mollusca, Arthropoda, Annelida, and Protozoa being more or less common all over the loch. Mollusca were common and generally distributed, except at that part of the loch called the "Shallows," the bottom of which consists of little else than fine sand, and is therefore not so suitable as a habitat for these organisms as where the bottom consists of mud or vegetable *débris*. Fourteen species of Mollusca were obtained, comprising five Lamellibranchs and nine Gasteropods. The more common forms were *Sphærium corneum*, *Pisidium fontinale*, *Valvata piscinalis*, and *Planorbis contortus*. The swan-mussel (*Anodonta cygnæa*) appeared also to be frequent.

The Crustacea were by far the most numerous and varied of the invertebrate fauna of the loch. Cladocera and Copepoda occurred in great profusion all over and through the water. *Daphniæ* were most abundant. *Cyclops*, especially *C. strenuus*, was also plentiful. Ostracoda were not so common in the loch itself as they were around its margin, particularly those parts that were more or less overgrown with vegetation, as round the north-east shore. Seventeen species of Ostracoda were obtained along this part of the shore; twelve species were obtained from the south shore, and only eight from the loch itself. Among the Cladocera the rare and interesting *Leptodora hyalina* occurred in considerable numbers; *Monospilus tenuirostris* was also frequent in the material collected at one or two places. The following were the common species: *Gammarus pulex*, *Diaptomus gracilis*, *Cypria serena*, *C. ophthalmica*, *Limnocythere sancti-patrici*, *Daphnia lacustris*, *Pleuroxus trigonellus*, *Chydorus sphaericus*.

The larvæ of insects were abundant in the loch, especially the larvæ of the Iphemeridæ. The Libellulidæ and Phryganidæ were also represented in the larval stage more or less frequently. Some idea may be

* See *Ninth and Seventeenth Annual Reports of the Fishery Board for Scotland*, part iii. 1890 and 1899.

formed of the myriads of these organisms present in the loch when it is stated that a conspicuous ridge composed of cast-off skins of insect larvæ, which had been washed ashore during the preceding stormy weather, extended along the margin of the loch for a considerable distance. The curious so-called "water-bears" (Tardigrada), now included in the class Arachnida, were common among the decaying vegetable matter at the bottom. Species of Notonectidæ, or "water-bugs," and of aquatic Coleoptera were also more or less common, though their distribution seemed to be more localized.

The worms were represented by several species—parasitic and non-parasitic. Among the former were *Schistocephalus solidus*, obtained from the body-cavity of a Stickleback (*Gasterosteus aculeatus*), and a species of tape-worm (*Bothriocephalus latus* ?), several of which were found in the alimentary canal of the trout, six specimens being taken from one fish. The heads of the parasites were fixed at the extreme end of the *cæca* or blind tubes of the stomach, and their bodies were so elongated as to extend well down into the intestine. Usually one parasite occupied a *cæcum*. *Tubifex rivulorum* was very common in the loch.

Rhizopoda were common all over the loch. Several forms were obtained in the dredged and hand-netted material; the more typical varieties observed were:—*Diffugia pyriformis*, *D. globularis* (much less frequent than the first named), *D. corona* (appeared scarce), *D. marsupiformis* (of frequent occurrence). Diatomacea were abundant, especially in the deeper parts of the loch, and included a considerable number of species.

Mr. Scott visited Loch Leven again in September and December, 1897, and in March and June, 1898, when he found that the free-swimming Entomostraca, though very abundant, consisted mainly of the one species, *Daphnia lacustris*. *Leptodora hyalina* was moderately common in the September gathering, but was not observed in any of the other three. *Diaptomus gracilis* was frequent in the gathering collected in December, but was scarce in the others. *Bythotrephes longimanus*, though present in both the September and June gatherings, was not observed in those collected in December and March. *Cyclops strenuus*, though present in all the gatherings, was scarce.

A few male *Daphniæ* were observed in the December gathering, but in none of the others; females with *pseudova* were frequent in all the gatherings. When the loch was examined in June, 1890, both *Daphnella brachyura* and *Polyphemus pediculus* were observed in the tow-net gatherings, but neither of these species was obtained in any of the gatherings recently collected. Infusoria and micro-algæ, which were moderately frequent on the first three occasions when the loch was examined, were quite abundant in the loch in June, but these minute forms did not appear to be generally diffused, apparently occurring in shoals, and being particularly plentiful to the south of Reed Bower.

The examination of the shore yielded a much greater number of species than were captured by the tow-nets, but individuals were not nearly so numerous. Fifty-five species of Crustacea were obtained in the shore gatherings collected during the recent experiments. The records of species obtained when the loch was examined in 1890 include a few that were not observed in the recent gatherings (viz. *Cypria exsculpta*, *Candona lactea*, *Ilyocypris biplicata*, *Bosmina longirostris*, *B. longispina*), and if these and the species captured with the tow-nets be added, they increase the number of crustacean species to sixty-five; it is quite probable that even this number will yet be added to when the loch comes to be more thoroughly examined. Only five species were observed in all the gatherings in 1890, 1897, and 1898, viz. *Canthocamptus staphylinus*, *C. minutus*, *Cypria ophthalmica*, *Candona candida*, *Chydorus sphaericus*. The species recently captured include one Amphipod (*Gammarus pulex*), and eighteen each of Copepoda, Ostracoda, and Cladocera. The largest number of species of Crustacea obtained in any of the recent shore gatherings from Loch Leven was in that collected on June 13. This gathering yielded thirty-nine species, or only four less than the total number observed in the tow-net and hand-net gatherings collected in June, 1890.

The Cladocera, as a whole, were scarcer in those gatherings collected in the colder months than in the others. It may also be stated that in March the level of the water was much higher than during any of the other visits, and this no doubt accounted, partly at least, for the great scarcity of Cladocera in the gathering collected at that time; the reduced temperature incidental to the season may also have had some influence in bringing about this result.

NOTES ON THE GEOLOGY OF THE DISTRICT AROUND LOCHS CHON AND ARD.

By Messrs. BEN. N. PEACH, F.R.S., and JOHN HORNE, F.R.S., from unpublished observations made during the course of the Geological Survey of Scotland.

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Loch Chon.—Loch Chon is a striking example of a rock basin. The upper portion of the lake is floored by mica-schists, and the lower portion by the Ben Ledi grits and schistose epidotic grits ("Green Beds"), the members of the two latter groups being repeated by sharp folds.* The trend of the loch—N.N.W. and S.S.E.—is oblique to the strike of the strata. At the head of the lake there is a broad alluvial flat, where it has been silted up for a distance of one-third of a mile by the detritus laid down by the adjacent streams. In the northern part of the basin the deepest soundings vary from 23 to 37 feet; but at a

* *Geographical Journal*, vol. xv. p. 342.

point about half a mile below the present head of the lake the depth increases from 40 to upwards of 60 feet. This feature coincides with a line of fault that crosses the loch in a north-east and south-west direction, its downthrow being to the south-east. From this point southwards for half a mile there is a narrow basin enclosed within the 50-foot contour-line, and within this basin there is a narrow trough, about 100 yards long and upwards of 75 feet deep, near the west margin of the lake. There is ground for the belief that nearly the whole of the basin bounded by the 50-foot contour-line is floored by mica-schist.

About a mile below the head of the lake the soundings prove a remarkable decrease in the depth, the 25-foot contour-line near the Heron islands being deflected towards the centre of the loch. The shallowing of the basin here takes place along the outcrop of very massive epidotic grits ("Green Beds"), several glaciated rocky islands appearing along this line. Southwards to the mouth of the lake there are alternations of Ben Ledi grits and schistose epidotic grits, the narrowest parts of the lake coinciding with the exposures of the latter group.

About 100 yards below the outlet of the lake a prominent band of schistose epidotic grits occurs, which evidently formed a rocky barrier during the glaciation of that region. Beyond this outcrop there is a small shallow basin, about 41 feet deep (Lochan Dubh), floored by schistose grits, which is traversed by a fault trending north-east and south-west, with a downthrow to the east. Across the mouth of this basin a band of massive pebbly grits of the Ben Ledi type has been traced.

A reference to the geological map accompanying Part I. will show that the direction of the ice-flow during the great glaciation coincides generally with the trend of the loch, striæ being found on the rocky islands as well as round the margin of the lake. The evidence supplied by the soundings tends to support the theory that the basin-shaped hollow has been eroded by ice-action. The dislocations referred to above have doubtless produced local modifications of the floor of Loch Chon, and of that of the small basin (Lochan Dubh), but they do not account for the excavation of the basin.

Loch Ard.—Loch Ard is also a true rock basin, which lies along the outcrop of a belt of slates between two bands of grit, the deepest part of the loch, as proved by the soundings, coinciding with the outcrop of the slates.

From the Mill of Chon downwards to the head of the lake there is a small alluvial flat pointing to the former extension of the loch in that direction. At the upper end the soundings show that the average depth is 25 feet, with the exception of one small depression opposite Ledard burn, reaching 57 feet in depth. Eastwards, where the loch becomes

narrower, the depth increases. The basin enclosed by the 50-foot contour-line is $1\frac{1}{2}$ miles long, while that surrounded by the 100-foot contour-line is three-quarters of a mile in length, the deepest sounding being 107 feet.

The dislocation, with a downthrow to the east, that crosses the loch in line with Allt-na-Sgéith in a north-east and south-west direction has not produced any local modification of the floor of the lake, if we may judge by the soundings. The 100-foot basin crosses this fault without any apparent increase in depth on the side of downthrow, which is probably due to the fact that the dislocation brings slates into contact with slates. The band of massive grit which forms for a long distance the southern margin of the loch evidently acted as a barrier during the period of glacial erosion. Crossing the lake at Briedach, this band of grit forms the promontory south-east of Glashart.

On referring to the geological map in Part I. it will be seen that the band of grit just described is followed southwards by slates, the outcrop of which coincides with an expansion of the loch at its outlet, the deepest sounding being 52 feet. About 600 yards to the east of the outlet, the trend of the latter belt of slates is east-north-east, and here occurs another small basin upwards of 30 feet in depth.

No ice-markings have been found round the margin of the loch or near it, but about half a mile to the south of the upper end of the lake the direction of the striæ is E. 20° S., which coincides generally with the long axis of the loch. Reference was made in the former paper to the more easterly movement of the ice as it left the mountainous region and approached the low-lying districts; the course of Loch Ard coincides with this easterly trend of the ice.

From the evidence adduced it is obvious that the geological structure of the basin of Loch Ard has had an important influence in the development of its present features, the latter being adequately explained by the theory of glacial erosion.

The Lake of Menteith lies in various superficial deposits, composed partly of boulder-clay and stratified beds of the 100-foot beach. It is within the area occupied by the Old Red Sandstone, and the solid rock is visible only at one locality, at Coilledon. Loch Leven likewise lies in superficial deposits.

PART III.—THE LOCHS OF THE TAY BASIN.

1. *Lochs Ericht and Garry.*

INTRODUCTION.

It is proposed to publish the results obtained in the lochs forming part of the drainage basin of the Tay as ready, and in this first instalment we shall deal with Lochs Ericht and Garry. The general conclusions will be reserved until the lochs of the whole basin have been

surveyed. We have referred in Part I. to Mr. Grant-Wilson's work on some of the lochs of the Tay basin; he has kindly supplied us with copies of his maps showing the soundings taken by him. We propose, as opportunity offers, to take soundings supplementary to, and corroborative of, those taken by Mr. Wilson, and indeed we have already taken about 150 soundings in Loch Earn. The geology of the district around Lochs Ericht and Garry has not yet been systematically worked out, and therefore any notes by Messrs. Peach and Horne will be reserved until the completion of the survey of the lochs in the basin.

MAPS AND ILLUSTRATIONS.

This part is illustrated by three maps and a temperature diagram. The maps are drawn to the same scale as has been adopted for the whole series, viz. 3 inches to the mile (1 : 21,120), the majority of the soundings being given in feet. The intervals between the contour-lines of depth are indicated by different shades of blue, and the intervals between the contour-lines of height of the neighbouring country by shades of brown.

Plates I. and II. show Loch Ericht, which, in order to avoid an extremely long map, has been cut into two portions, the contour-lines of depth being drawn in at 50, 100, 200, 300, 400, and 500 feet.

Plate III. is a longitudinal section of Loch Ericht, showing the distribution of temperature as observed on June 15 to 20, 1900; this will be referred to in greater detail under temperature observations.

Plate IV. shows Loch Garry, the contour-lines of depth being drawn in at 25, 50, 75, and 100 feet.

DEPTHS OF THE LOCHS.

Loch Ericht.—Loch Ericht is a large Highland loch situated partly in Perthshire and partly in Inverness-shire, at a high elevation among the Grampians. It is one of the wildest and most magnificent lochs of Scotland, presenting all along its shores scenes of lonely grandeur and sublimity, the mountains rising from the water's edge to great altitudes, their sides scarred by mountain torrents. The surface, when measured by the Ordnance Survey officers in 1872, was found to be 1153·4 feet above the level of the sea; it is thus one of the most elevated of the larger Scottish lochs. It is known to anglers as the home of large *Salmo ferox*, as well as of trout said to be equal in quality to those of Loch Leven. It trends in a north-east and south-west direction, and is broadest near the southern end, narrowing gradually towards the northern end. It is over $14\frac{1}{2}$ miles in length, and over 1 mile in maximum breadth; the mean breadth is about half a mile, being $3\frac{1}{2}$ per cent. of the length. Its waters cover an area of over 4600 acres (or nearly $7\frac{1}{4}$ square miles), and it drains an area seven times greater, or over 32,000 acres (nearly $50\frac{1}{2}$ square miles). The total number of

soundings taken in Loch Ericht was 488, which show that it is a comparatively deep loch, the greatest depth observed being 512 feet. The mass of water contained in the loch is estimated at 38,027,000,000 cubic feet, and the mean depth at 189 feet, being 37 per cent. of the maximum depth. The length of the loch is 150 times the maximum depth, and 405 times the mean depth.

The deepest part of the loch is in the southern broader portion, where, about $3\frac{1}{2}$ miles from the foot of the loch, there is a small central depression, about one-third of a mile in length, and covering about 58 acres, in which the depths exceed 500 feet, the maximum being 512 feet. There are two 400-foot depressions, the larger, about three miles in length, reaching to about $1\frac{1}{2}$ miles from the southern end, and enclosing the 500-foot depression. Separated by about a quarter of a mile from the northern end of the large 400-foot depression is the second smaller isolated depression, in which the maximum depth is 410 feet. There are two 300-foot depressions, the larger in the southern portion of the loch, the smaller in the northern portion. The southern depression is over $4\frac{1}{2}$ miles in length, and encloses the deepest water in the loch. The northern smaller depression is under one mile in length, with a maximum depth of 314 feet, and approaches to within $2\frac{1}{2}$ miles of the head of the loch. There are two 200-foot depressions; the larger runs from within a mile of the southern end to more than halfway towards the northern end, being over 7 miles in extreme length. It is separated from the northern 200-foot depression by an interval of $2\frac{3}{4}$ miles, in which the depth varies from 127 to 194 feet. The northern 200-foot depression is nearly $2\frac{3}{4}$ miles in length, approaching to within about $1\frac{1}{4}$ miles from the northern end, and enclosing the small northern 300-foot depression already mentioned. The 100-foot depression is a continuous area extending from within less than half a mile of the southern end to within less than a mile of the northern end, and is about $13\frac{1}{4}$ miles in total length. The 50-foot depression follows approximately the contour of the loch. Opposite Loch Ericht Lodge an isolated sounding of 44 feet was observed between the 50- and 100-foot lines, and about $1\frac{1}{2}$ miles farther down, opposite the entrance of the Allt Càmus nan Cnàmh, another isolated sounding of 20 feet was taken, surrounded by deeper water.

The area of the bottom of the loch lying between the shore and the 50-foot line is estimated at about 880 acres (or 19 per cent. of the total area of the loch), that between the 50-foot and 100-foot contours is estimated at 695 acres (or 15 per cent.); that between the 100- and 200-foot contours is estimated at about 1160 acres (or 25 per cent.); that between the 200- and 300-foot contours at about 875 acres (or 19 per cent.); that between 300 and 400 feet at 476 acres (or over 10 per cent.); that between 400 and 500 feet at about 474 acres (or over 10 per cent.); and that over 500 feet at 58 acres (or $1\frac{1}{4}$ per cent.).

It will thus be seen that Loch Ericht is of very simple conformation.

The deeper parts are divided into two basins, by the constriction in the outline of the loch in the vicinity of Loch Ericht Lodge, where, in one place, it is less than a quarter of a mile in width, but even here the depth in the centre exceeds 100 feet.

Loch Garry.—Loch Garry * lies to the east of Loch Ericht, at a still higher elevation, and the scenery round about is very wild; the height of the surface of the loch above sea-level is not given on the Ordnance Survey map, but a height of 1326 feet is shown near the outlet, so that the level of the loch is probably about 1320 feet above the sea. In trend and in outline it somewhat resembles Loch Ericht, narrowing towards the northern end. It is over $2\frac{1}{2}$ miles in length, the maximum width being over a quarter of a mile; the mean breadth is slightly under a quarter of a mile (being 9 per cent. of the length). Its waters cover an area of about 390 acres (three-fifths of a square mile), and it drains an area 37 times greater (or about $22\frac{1}{3}$ square miles). The total number of soundings taken in Loch Garry was 141, the maximum depth observed being 113 feet. The mass of water contained in the loch is estimated at about 846,000,000 cubic feet, and the mean depth at nearly 50 feet (being 44 per cent. of the maximum depth). The length of the loch is 119 times the maximum depth, and 260 times the mean depth.

Loch Garry forms a simple basin, except that the bottom sinks into two depressions exceeding 100 feet in depth, separated by depths of 82 to 93 feet. The larger but shallower depression is situated in the southern half of the loch, and is over a quarter of a mile in length, the maximum depth observed therein being 105 feet. The smaller but deeper depression is situated in the northern half of the loch, being only about one-sixth of a mile in length, and containing the maximum depth of the loch—113 feet. The 75-foot, 50-foot, and 25-foot depressions form continuous areas, following approximately the outline of the loch. The 75-foot depression is nearly $1\frac{3}{4}$ miles in length, the 50-foot depression nearly 2 miles in length, and the 25-foot depression $2\frac{1}{8}$ miles in length.

The area of the bottom between the shore and the 25-foot contour-line is about 117 acres (or 30 per cent. of the total area of the loch); that between the 25- and 50-foot contour-lines is about 83 acres (or 21 per cent.); that between 50 and 75 feet is almost the same; that between 75 and 100 feet is about 87 acres (or 22 per cent.); and that over 100 feet is about 19 acres (or 5 per cent.).

The details regarding the physical features of Lochs Ericht and Garry are collected together in the table opposite.

DEPOSITS.

The deposits from Loch Ericht are interesting because of the evidence of layers of different colours. At a depth of 50 feet a red sandy

* This loch must not be confounded with the larger Loch Garry in Inverness-shire.

Loch.	Elevation of surface above the sea.	Number of soundings.	Length. Miles.	Breadth, miles.		Mean breadth per cent. of length.	Depth.			Ratio of depth to length.		Volume, million cubic feet.	Area of loch.		Drainage area.	
				Max.	Mean.		Feet.	Mean per cent. of max.	Max.	Mean.	Square miles.		Total in square miles.	Ratio to area of loch.		
Ericht ...	1153	488	14.5	1.0	0.50	3.5	512	189.201	37.0	150	405	38,027	7.21	50.39	6.99	
Garry ...	1320	141	2.55	0.3	0.24	9.4	113	49.910	44.2	119	270	846	0.61	22.34	36.62	
		629										38,873	7.82	72.73	9.30	

mud was obtained; at 112 feet the mud was white beneath and brown on top; at 124 feet it was all brown; at 153 feet all brown; at 182 feet sandy and white; at 184 feet white and brown; at 245 feet the deposit was a light-coloured mud, with a thin brown layer 1 inch in thickness on the top; at 270 feet it was white below, black-brown above; at 366 feet the mud was all dark-brown; at 385 feet there was a white clay or mud, with a dark layer on the top; at 456 feet the mud was all black; at 497 feet a section of black mud 5 inches in thickness was obtained; and at 510 feet the same black mud was found, without any trace of the lighter-coloured mud.

The sand from 50 feet consisted largely of mineral particles (probably 70 per cent. of the whole deposit) with a mean diameter of about 0·6 mm., one or two rock fragments attaining a diameter of 7 mm. The remainder of the deposit consisted of clayey and vegetable matter, with minute mineral particles less than 0·05 mm. in diameter, diatoms, sponge spicules, and entomostracous skeletal remains. The light-brown mud from 150 feet contained about 30 per cent. of mineral particles, with a mean diameter of 0·5 mm., the largest being 5 mm. in diameter, with clayey and vegetable matter, and organic remains as previously mentioned. The dark-brown mud from 366 feet contained only about 10 per cent. of mineral particles (quartz, black and white mica, etc.) exceeding 0·05 mm. in diameter, the mean diameter being about 0·2 mm. Samples of the two different coloured layers of mud from a depth of 385 feet were submitted to analysis, with the following results:—

			Bottom layer.	Top layer.
Organic matter	...	...	10·00 per cent.	26·8 per cent.
Insoluble residue	...	...	73·70 "	57·6 "
Iron oxide	...	...	13·64 "	17·2 "
			<hr/> 97·34	<hr/> 101·6

These analyses seem to show that the upper layer contained more organic matter (presumably vegetable matter) and a little more iron than the lower layer. Microscopic analysis of the two layers indicates that the mineral particles were rather more numerous and larger in the top layer, while the clayey matter seemed to be more abundant in the lower layer.

TEMPERATURE OBSERVATIONS.

The serial temperatures taken while sounding out Lochs Ericht and Garry in June, 1900, are given in the following table, and those taken in Loch Ericht are shown graphically in the temperature section (Plate III.) accompanying this paper, since they are extremely interesting as illustrating the effect of the wind upon the distribution of temperature.

Depth in feet.	Loch Garry.	Loch Ericht.					
	June 21, 1900.	June 19, 1900, $\frac{1}{2}$ mile from S. end.	June 20, 1900, $1\frac{1}{2}$ miles from S. end.	June 20, 1900, $3\frac{1}{2}$ miles from S. end.	June 16, 1900, $9\frac{1}{2}$ miles from N. end.	June 15, 1900, $5\frac{1}{2}$ miles from N. end.	June 20, 1900, 1 mile from N. end.
	°	°	°	°	°	°	°
0	57·0	47·3	49·0	50·0	50·0	53·2	55·1
5	—	47·0	48·7	49·7	—	—	—
6	—	—	—	—	50·0	—	—
10	56·9	47·2	47·8	49·5	—	—	—
25	—	—	—	—	49·9	—	—
30	49·5	46·1	47·5	48·6	—	—	54·2
40	—	—	—	45·8	—	—	—
50	—	44·6	44·7	44·7	44·8	—	52·3
60	46·3	43·4	—	—	—	—	—
75	—	42·6	43·2	—	—	—	44·0
98	—	—	—	—	—	41·5	—
100	—	42·2	—	42·9	42·6	—	—
105	46·0	—	—	—	—	—	—
120	—	—	—	—	—	—	42·7
150	—	41·3	—	—	—	—	—
200	—	—	—	41·0	41·1	—	—
300	—	—	—	40·7	40·5	—	—
400	—	—	—	40·5	40·5	—	—
500	—	—	—	40·5	—	—	—

Loch Ericht.—Like Loch Katrine, Loch Ericht is said never to freeze over, and the surface temperature remains comparatively low throughout the summer. The surface temperatures taken in Loch Ericht during the visit from June 15 to 20 show a range of $10\cdot4^{\circ}$, viz. from $46\cdot6^{\circ}$ to 57° ; the higher temperatures were obtained towards the northern end of the loch, and the lower temperature towards the southern end of the loch. A glance at the temperature section (Plate III.) based upon the observations given in the table shows that the warmer water was all collected towards the upper end of the loch, as the result of a south-easterly wind which blew at times during the six days that were devoted to the survey of the loch, colder water having been drawn up at the opposite end of the loch to supply the place of the warmer surface water driven before the wind.

Loch Garry.—Loch Garry was visited on June 21, 1900, when the surface temperature was found to vary from 57° at the south-west end to $59\cdot4^{\circ}$ at the north-east end, and this would seem to indicate a distribution of temperature similar to that observed in Loch Ericht, but since only one temperature series was taken, it is impossible to form an idea of the distribution of temperature throughout the whole body of water.



PROF. FOREL ON LIMNOLOGY.

By HUGH ROBERT MILL, D.Sc., LL.D.

THE appearance of a handbook of Limnology * may be looked upon as the formal admission of the science of lakes to its independent position somewhere on the borderlands of geography, very near the place occupied by oceanography. Prof. Forel is the one man capable of writing such a book—at least, that is what we believe to be the opinion of every limnologist but one, the exception being Prof. Forel himself. In the preface he explains his views on the subject of text-book writing so persuasively, that one turns back to the title-page in some trepidation for confirmation of the authorship. A handbook, he says, should be an impartial and impersonal treatment of a subject, a measured and critical statement of facts and theories free from the particular bias inevitable to one who has himself worked at the science from the commencement. He goes on to say—

“ My relation to limnology is much too personal and subjective for me to be able to give an objective presentation of the facts. I asked the editor of the series to consider this ; I pointed out that a geographer who had perhaps never set foot in a boat or hauled a dredge, but who had studied limnology just as he had studied the other branches of physical geography, would be far better fitted than I for such a work. . . . The editor was not of my opinion.”

The book was written in French, and translated by Prof. Wilczek, the author's happy style being very successfully rendered in the heavier language. The English reader has the advantage of getting a new view of the technical French terms used by the author in his great monograph on the Lake of Geneva, which are here authoritatively given in German also, and from the two an English equivalent can be more easily supplied than from either alone.

With regard to the systematic position of limnology, Prof. Forel gives the following definitions, and introduces the following terms :—

“ Geography is the science of the Earth in its threefold composition of lithosphere, hydrosphere, and aërosphere. The special study of the hydrosphere is hydrography. Liquid water appears in three ways upon the Earth—in the sea, in lakes, and in rivers ; and hydrography is correspondingly divided into the three departments—

“ Oceanography, which is occupied with the unlimited, united, and all-embracing ocean.

“ Limnology, which is concerned with the scattered and isolated portions of the hydrosphere occurring upon the land as lakes.

* Handbuch der Seenkunde. Allgemeine Limnologie von Dr. F. A. Forel. (Bibliothek geographisches Handbücher herausgegeben von Prof. Dr. Friedrich Ratzel.) Stuttgart : J. Engelhorn. 1901.

"Rheology, which studies the running water of the land in springs, brooks, streams, and rivers.

"If we include solid as well as liquid water with the hydrosphere, then a fourth subscience, Glaciology, must be added."

Stress is laid on the fact that limnology may be viewed as oceanography in miniature, but that, on account of the diversity and individuality of lakes, there is a special limnology for every lake-basin, each lake being looked upon as a microcosm.

In a handbook of moderate dimensions it would be impossible to go into the detailed studies which have been made of innumerable lakes all over the world, and the author has very wisely limited himself to the task of stating in a clear and logical way the general principles and leading facts which apply to all lakes. How comprehensive these are may be gathered from the following condensed summary.

Part I. deals with lake-basins, considering the origin of the primitive hollow* in which water came to collect, the principle of hydrographic charts to delineate them, the grouping of lakes in special districts, the change of the primitive hollow into a lake-basin by the action of the water of the lake itself and of tributaries, and on the nature and formation of lacustrine deposits. The first part ends with an outline of limnometry, or the methods of lake-measurement, and a statement as to the classification of lakes by their relation to the general progress of change, during which they may successively be classed as young, mature, old, and dead.

The second, and much the longer, part deals with the water of lakes, as regards its economy, or the relation between gain by inflow and loss by outflow and evaporation; hydraulics, or the movements of water by waves, seiches, and currents; the chemical, thermal, optical, and finally the biological conditions. The chapter on thermal conditions is of special interest, as it contains a system of classifying deep lakes according to what we may call the climate of their deep water into a tropical series, where the bottom temperature is always higher than the maximum point, 39° Fahr.; the temperate type, where it is constant at 39°; and the polar type, where it is always below 39°.

The Biological chapter introduces a terrible plexus of terminology, which, in contrast to the simple clearness of the physical part, suggests that there may be a new danger of darkening counsel by words with too much knowledge. Thirty-seven composite terms are defined separately, each containing or qualifying the word "plankton," and designed to specify every possible variation in habitat, form, or mode of life of the drifting organisms in lakes. For example, the Morphoplankton,

* *Wanne* or *Cuvette*, literally *tub* or *basin*, but the English word "basin" is reserved as the equivalent of *Becken* and *Bassin*, and "tub" is too colloquial, and apt to be confounded with "trough," which corresponds to *Mulde*.

which are a division of the Euplankton, are in turn subdivided into the Raphidoplankton, Skaphoplankton, Desmoplankton, and Kremastoplankton. They at least suggest that the initiator of the resounding series "was a scholar and knew Greek." Prof. Forel says of it all—

"Are these foreign words ever necessary? It is seldom that an idea or a fact cannot be expressed in familiar language. New words, even when they are not absolutely necessary, are often very convenient for their coiner, but they are usually only useless ballast to the reader. . . . If our beautiful science is not to become repulsive, we must abstain from disfiguring it by the introduction of too many foreign words, and take care that limnology be not made incomprehensible to the many general readers interested in the study of lakes by the use of such expressions."

A very brief bibliography completes the volume, but, though it contains few entries, it records the sources where bibliographies of the subject appear periodically. There is a serious omission, however, in the shape of the "Geographical Literature of the Month" in the *Geographical Journal*, which contains as full a record of the progress of limnology as any of the German and French works which are cited.

ROCKHILL'S 'RUBRUQUIS.'—REVIEW.

By C. RAYMOND BEAZLEY.

THE Hakluyt Society has published this year a new version of the Journey of William of Rubruck, or Rubruquis, the Itinerary of John de Plano Carpini (Pian de Carpine), and the Narrative of Benedict the Pole. Mr. W. W. Rockhill, the editor, has accompanied his translation with many useful notes, and an introduction that provides a good summary of the great movement of missionary and diplomatic travel from the Christian to the Mongol courts in the middle of the thirteenth century. The translator's knowledge of Chinese, Mongol, and Tibetan sources has enabled him to throw additional light on several passages, and, with some exceptions, he has taken into account all the leading Western authorities.

It seems ungracious to criticize a work which has absorbed so much of the time of a public man, and in which there is so much valuable information, but Mr. Rockhill himself would be the last to wish for a merely formal reception of his edition from those who have consulted it. We may venture to suggest for his consideration the following points: Has he, while approaching Rubruquis, so to say, from the side of China, Mongolia, and Tibet, given sufficient attention to his author from the side of Russia? Has he not also, in pleading for a proper sense of his author's great and undoubted merits (undoubted now,

whatever they were in the past), greatly under-estimated John de Plano Carpini? As to the former point, Mr. Rockhill obviously does not pretend to deal with the Western or Russian aspect of Tartar conquest and Rubruquian travel as he deals with the Eastern; here, therefore, he is occasionally led into misconceptions, and his spelling of Russian names and references to Russian geography and history are not always satisfactory. Thus, on pp. 3, 4, 8, etc., we have Kiew, Danilow, Alexandwsk; but also Volga and Vladimir, like Saratov on p. 121; again, the isthmus of Perekop is not the sole connection between the Crimean peninsula and the mainland, as seems implied on p. 92, note; and it should not be suggested, as on p. 100, that the *Kerkis*, Cherkess, or Circassians any longer occupy the Caucasian slope of the Black Sea and Sea of Azov. As to Carpini, he surely has a right to the indulgence of all modern readers who fairly consider his work of exploration, the immensity and daring of his journey, his pioneer position among the Friar travellers of the thirteenth century, his revelation of "Scythia" to the Christian and Latin world, his admirably lucid and informing narrative, his superiority to all other mediæval writers *de moribus Tartarorum*, as the first European ethnologist of Central and Northern Asia. If, in the case of Rubruquis, we must "be to his faults a little blind, and to his virtues very kind," why should not Friar John have the same privilege? Thus, while the latter is rather severely dealt with for his confusion about the sea into which the Volga and Ural rivers flowed, the former is praised (p. 97) for "correctly locating the sources of the Don" at Ivan lake, in Tula province, whereas he really derives the Tanais from the Mæotid Fens extending to the ocean in the north. The ever-recurrent and sometimes excessive obscurity of Rubruquis' language (as in the reference to Sartach on p. 256) might surely have been admitted and contrasted with the illuminating clearness of John de Plano. And it seems to be straining the point to ignore or deny (p. 42, 109) that Carpini mentions the Turks, when he names *Turkia* and the Sultan of Rûm. The excellent description of the people of Cathay (quoted on p. 155, n. 1), as well as the account of Mongol views on a future life, so curiously similar to those of the American Indians (quoted on p. 54, n. 1), are among many (over fifty) passages cited by the editor from Carpini, which not only illustrate the text of Rubruquis, but themselves establish beyond cavil the value of that John "of Polycarp," whom Friar William misnames and utilizes.

To come to a lesser matter: Would it not have been better, in a version which does not attempt to be archaic, to relegate to the footnotes such archaic forms as *Hermenia*, *Turkie*, *Turkemans*, *Yconium*, *Silicia*, *Eufrates*, *Curges* and *Curgia*, *Catalogna*, *Tefilis*, *Mulihec*, *Axasins* (pp. 118, 271, 275, 280, etc.)?

The repeated and rather emphatic references to Mandeville (*e.g.* p. 120, 122), as if an independent authority of some weight, are

surprising; the *agriobous* of Cosmas ('Christian Topography,' 360) is only by conjecture, and perhaps questionably, identified with the yak (p. 151, n. 1); Rubruquis' *supertunicale diaconi* cannot well be translated *chasuble*, as on p. 153; *books*, on p. 253, is a misreading for *children* (*libros* for *liberos*); the name of *Seres*, as derived from a city, may surely be traced further back than Isidore (p. 155); *Jordanes* is a preferable form to *Jornandes* (pp. 42, 100, 157); *ickon* is apparently a misformation for *ikon* or *eikon* (on 272, n. 1); and it is not easy to see how an *eikon* could be mistaken for a cross, as the editor suggests. Again, the feast of St. Mary Magdalene is not June 22, but July 22 (p. 96); and the *Sentences* which Rubruquis mentions among the books of which he was specially fond (p. 106) are probably the famous work of Peter Lombard, the *Magister Sententiarum*, and not a "breviary." It seems an exaggeration to say (p. 119, n. 2) that all Herodotus' successors down to Ptolemy believed the Caspian to be an inlet of the ocean; nor was the sea of Aral quite "unknown to the ancients" (p. 131, note 2); for Ammianus Marcellinus apparently refers to it; while Ptolemy's *Oxiana palus* may conceivably be meant for the same. Lastly, a more careful revision of the proofs would probably have discarded the forms and phrases *Lepinsk*, south of *Baikal*, for *Lepsinsk*, south of *Balkhash* (p. 139, n.); *Michel* for *Michael*, or *Mikhail* (p. 135); *Iugurs* for *Uigurs* (p. 234, cf. 147, etc.); *Capchac* and *Capchat* (pp. 92, 93, 101) for *Kipchak*; *Policarp* for *Polycarp* (p. 123); *Tului* for *Juchi* (p. 122); *patene* for *paten* (p. 216); *pailing* for *paling* (p. 220); *court* for *coast* (p. 201); *Tyr* for *Tyre* (p. 51); *lent* for *Lent* (p. 11); and also the "second Sunday of Quadragesima" (pp. 272, 273) would doubtless have been replaced by the more usual form, if the editor had had time and opportunity thoroughly to overhaul this volume, for which all students of mediæval geography owe him their sincere and cordial thanks.

THE MONTHLY RECORD.

EUROPE.

The Origin of the Scenery of the Lake District.—At a recent meeting of the Geological Society, Mr. R. D. Oldham, of the Indian Geological Survey, read a paper on the origin of the Dunmail Raise. Its form, he says, is that of an old river-valley, now occupied by much smaller streams than that which formed it. Such a gap cannot have been formed by recession of watersheds or capture through erosion; for in either case the stream on one side or the other of the watershed must necessarily fit its valley, while in the Dunmail Raise there is a misfit on both sides. The gap was in existence before the Glacial period, and consequently cannot have been formed by ice; and so by a process of exclusion the explanation is arrived at that the gap of the Dunmail Raise was formed by a river which flowed across the hills from north to south, and cut down its channel *pari passu* with the

elevation of the hills. The final victory of upheaval over erosion, whereby this river was divided into two separate drainage-systems, and the barrier of the Dunmail Raise upheaved, may have synchronized with a diversion of the headwaters and a consequent diminution of volume and erosive power. It was pointed out that this explanation comes into conflict with previously published theories of the origin of the drainage-system of the Lake District as radiating from the centre of a dome-like upheaval. The existence of a large river crossing the area of upheaval and maintaining its character of an antecedent river-valley for a long period, shows that the surface was originally a peneplain of sub-aerial denudation, and not a plain of marine sedimentation or erosion. From this it follows that the course of the main drainage-valleys may not have been determined by the original uplift, but by the cutting-back by erosion into the rising mass of high ground—in other words, that the principal valleys of the Lake District may be subsequent, not consequent, in origin.

Geomorphological Investigations in the High Alps.*—The work of Prof. Richter is mainly concerned with the corries, amphitheatres, and trough-like valleys of the Alps. The origin of corries (*Welsh*, cwms; *Fr.*, oules; *Ger.*, Kahre or Kare) has given rise to much discussion, some of which, perhaps, is due to calling different forms by the same name. For Prof. Richter a corrie is a rounded niche in a mountain-side, with angular walls and ice-polished sills, and can be formed only in a climatic zone where there is no flowing water, but where its place is taken by slowly moving snow or ice, while the bare rock is exposed to many temperature changes near the freezing-point. They are to be distinguished from the similar but not homologous forms in the mountains of desert regions, where the wind removes the rock-waste falling from the steep sides of the niche, and from the amphitheatres in horizontal sandstones caused by water-erosion, such as those in Saxon Switzerland. The true corrie originating above the snow-line, distinguishable by its roughly weathered sides, may be distinguished as active, where the glacier still covers the bed, and inactive, where the polished surface is ice-free. If only a line of "active" corries is found in a mountain region, the present may be considered the minimum snow-line. If "inactive" corries occur, they reveal the limit of a former snow-line; and with the addition of the morainic deposits help us to picture the past glacial development. The difficulties of interpretation in the case of mountains with existing glaciers are numerous. Corries rarely occur where the slope is over 31° , and are not found in the deeper regions of the interior of higher groups. The alpine forms above the snow-line of the ice age are due to ice. Long ranges have the sharp forms common to most lofty mountains, with corries and sharp ridges between, although the glaciers have vanished, or were much more important. Much waste has been removed from the corries, and at the corrie-line is a denudation surface, which is well marked in the Eastern Alps, which were not strongly glaciated in the ice age. Here the snow-line was between 1600 and 1800 metres, which, when compared with the values for the Tuscan Apennines and Balkan peninsula, show that a marked extreme (so-called "continental") climate existed in the Eastern Alps, while in the Mediterranean region marine influences raised the level of the snow-line.

The Lakes of the Karst.—All the most important lakes of the Karst region of Austria-Hungary have lately been the subject of detailed exploration by Dr A. Gavazzi, who will shortly publish the results in the *Abhandlungen* of the Vienna Geographical Society. The first section will deal with the lakes from a

* "Geomorphologische Untersuchungen in den Hochalpen." Von Dr. E. Richter. *Petermanns Mitteilungen*, No. 132. Gotha, 1900.

morphological and statistical point of view, and we are enabled, through the author's courtesy, to here record the principal facts brought out by his researches. Dr. Gavazzi divides the Karst lakes into perennial and periodic lakes, again subdividing the first category into fresh-water, brackish, and salt-water lakes, the second according as they communicate with the sea above or below ground. The following table gives the principal *data* for the perennial lakes, the arrangement within the separate groups being according to the volumetric measurement of the basins :—

	Origin and class.	Altitude (feet).	Area (square miles).	Depth (feet).		Volume (millions of cubic feet).	Mean slope.	
				Max.	Mean.			
Fresh-water lakes—								
Vrana (Cherso island)	Rift-polje; crypto- derpession *	c. 46	2.15	276	128.9	7704.5	5.5	
Vrana (Dalmatia) ...	Anticlinal polje; Crypto-depression	2	11.58	13	6.9	2230.0	0.2	
Baćine „ ...	Crypto-depression	14	0.85	104	37.7	895.5	6.5	
Kozjak (Croatia) ...	—	c. 1758	0.31	162	56.7	475.5	16.5	
Proložak (Dalmatia)	Polje 	843	1.25	135	10.8	375.1	1.5†	
Prožće (Croatia) ...	—	c. 2077	0.24	132	43.3	295.0	14.0†	
Čepić (Istria) ...	—	79	3.16	8†	3.0	263.6	0.1	
Njivice (Veglia island)	Anticlinal crypto- depression	c. 16	0.29	32	11.5	90.4	1.5†	
Doberbob (Görz) ...	Anticlinal erosion hollow	c. 33	0.14	30	1.6	6.7	0.3	
Blindinjer (Bosnia) ...	— •	3878	1.29	—	—	—	—	
Brackish lakes—								
Blato (Meleda island)	—	—	0.03	—	—	—	—	
Blatina „	—	—	0.02	—	—	—	—	
Salt-water lakes—								
Novigrad } (near Zara,	Remnant of Upper	{	0	11.06	125	60.7	18730.1	1.3
Karin } Dalmatia)			0	2.11	51	27.9	1640.8	1.2
Prokljan (river Krka,	Subsidence ...	{	0	4.28	79	30.2	3621.7	1.3
Dalmatia)... ...								
Vlasko	(Narenta	{	0	0.16	46	20.3	89.3	4.0
Kuti, or			0	0.57	15	4.3	78.2	0.5†
Gjuvelek								
Desno jezero			0	0.34	8	2.6	23.4	0.5†
Modrosko			0	0.01	60	—	—	—
Muravnjak (Lunga	island)	{	0	0.09	19	9.3	23.7	2.2
island) 								

The greater number of the lake-basins slope in concave curves to the deepest point, those in which the slope is convex, giving a volume less than that of a hollow cone of the same surface area and depth, being distinguished in the table (last column) by an obelisk. Of periodic lakes and periodically-filled “poljes,” the following, in addition to the well-known Zirknitzer See, were among others examined by Dr. Gavazzi: Kukuljanovo, Dabaz, and Svica, in Croatia; Nadin, Bokanjac, Plina, Jezerce, and Rastok, in Dalmatia; Busko Blato, in Bosnia.

The Lakes of the Reschen-Scheideck.—Of the passes crossing the region between the basins of the Inn and the Adriatic, two, the Maloja and the Reschen-Scheideck, are remarkable for a number of lakes. In the former case the lakes lie

* I.e. a lake in which the bottom is below sea-level.

† 28 feet in a “ponor.”

† Convex curve.

north of the watershed, at the sources of the Inn; and in the latter south of it, at the sources of the Adige. Ascending the Stillebach from the Inn at Finstermünz, the watershed is crossed at an elevation of 1510 metres, and a wide gently sloping valley is entered, close to a small stream called the "source of the Adige." In this stretch of valley, 23 miles long, with a fall of 2526 feet, are three lakes, the Reschensee (elevation 4848 feet), the Mittersee (4835 feet), and the Haidersee (4753 feet). The region is obviously one of peculiar interest, not only locally, but in the history of the Alps generally, and an exhaustive examination of it and of the lakes has accordingly been made by Prof. D. Müllner, whose results are published in the first number of the seventh volume of Prof. Penck's 'Geographische Abhandlungen.' Prof. Müllner first describes the positions of the lakes and their surroundings, and discusses the probable origin of the lakes themselves and of the peculiar region they occupy. Next he gives an estimate of the area draining each lake, and a minute study of their areas and depths; then a study of the levels of the water surfaces and their variations, and of their precise relation to the rainfall over the catchment area; and finally an account of the freezing of the lakes, with an estimate of the quantities of heat absorbed and set free by the formation and melting of ice.

ASIA.

New Administrative Division in North-West India.—A step which has been meditated for some time, and of which the need was specially demonstrated at the time of the last North-West Frontier war, has been taken by Lord Curzon in the formation of a new administrative area on that frontier. Although it has been spoken of as a "province," this is not strictly correct, as it is to be administered in the same way as Baluchistan, which is an "agency" administered, not by a lieutenant-governor, but by a political officer directly responsible to the Viceroy. As in Baluchistan there is British territory administered by a civil staff drawn from the Indian Civil Service, and native territory merely under political supervision like any other native state in India, so in the new agency there will, it seems, be both British and native districts. The former, which have hitherto formed the Trans-Indus portion of the Punjab, making up about a fifteenth part of its administrative area, are included, geographically, in the Hazarajat, Peshawur valley, and the Dera-jat down to the Baluch frontier. They will probably continue to be administered by the present civil staff. The independent districts lying beyond the borders of British India proper, and between it and Afghanistan, are those of Swat, Mohmand, Afridi, Tuvî, Dawari, Waziristan, etc., which may be summarized as the Pathan tribes of the borderland up to the Kashmir frontier, together with the non-Pathan district of Chitral. As the frontier force is now directly under the command of the commander-in-chief, it seems quite in accordance with the fitness of things that the administration of the frontier should be, as it will, directly in the hands of the viceroy. Strategically, the position on the Pathan border will still be different from that in Baluchistan, as the advance posts are not connected by lines of occupation such as would dominate and enclose the independent tribes between them and the British border, who have always a retreat into Afghanistan open to them in case of need. On the Baluch frontier they are so enclosed.

Kozloff's Expedition to the Gobi.—The early stages of this expedition were described in the *Journal* for January, 1900 (p. 56), while the receipt in Russia of further news was subsequently recorded. M. Kozloff and his companions have now finished their work, an outline of which, from letters published in the *Izvestia* of the Russian Geographical Society, is given by M. Deniker in the first number of *La Géographie* for the present year. M. Kozloff left Kobdo in August, 1899, for the exploration of the Mongolian Altai, following the valley between the

northern and southern ranges, which at first were composed of pink and grey granite, denuded by atmospheric agencies. Passing the Khulmu-nor, he reached Lake Begher, situated between the low northern range and the high *massifs* of Khara-Atzarga and Burkhan Buda in the south. Both chains are covered up to about 6000 feet with thick forest. Mysterious sounds, which had been spoken of by the natives as emanating from these mountains, were found to be due to the meeting of the warm current of air from the plain with the cold air of the mountains. Near Kharghin Tsagan-nor patches of "sulhir" (*Agriophyllum gobicum*) were noticed, the seeds of which, as was found to be the case in Alashan by Prjevalsky, were eaten by the Mongols. The southern chain (known as Altain-Nuru) terminates east of the Burkhan Buda, near the fresh-water lake Khuduk-nor. The route from Uliassutai to Yu-men-hsien, near Suchau, passes to the east of the lake. After a stay in this neighbourhood MM. Kozloff and Ladyghin proceeded to Orok-nor, at the foot of the northern chain (here formed by the great and little Bogdo), and, passing the Artsa Bogdo, which marks the point at which the range bends to the south-east, reached the well of Chatseringhi-Khuduk, south-west of Ulan-nor, which is placed some 60 miles too far east by Pievtsof. The well lies opposite the huge triple mass of Gurban-Saikhan. Here Kozloff met Koznakoff, who had explored the southern versant of the Altain-Nuru—barren slopes cut by numerous gullies, prolonged as ravines in the plain. This is the abode of the *Antelope gutturosa* and of an animal named "taka," which is probably the *Equus Prjevalskii*. Some half-nomad Mongols were met with on the Bijen-gol, which serves to water their fields, and supports a fairly abundant vegetation. Further east the desert reappears, and is dominated in the north by the Ike Tain, a portion of the Altain-Nuru, and stretches south to the chain of Aji-Bogdo, some of the peaks of which were covered with snow in October. Whether or not this belongs to the Altai system seems doubtful. Koznakoff afterwards crossed over to the northern chain, passing the monastery of Yum-Beisin, the residence of a "Khubilgan" or Buddhist incarnation, and finally reaching the well of Sairen on Prjevalsky's itinerary between Urga and Alashan. In this part of Mongolia the administration of the districts is in the hands of ecclesiastics, chosen, like the Khubilgans generally, from secret indications on the part of the higher clergy. The second part of the work of the expedition consisted of the survey of three separate routes across the least-known part of the Gobi. M. Kozloff chose the most easterly route, which led a little east of the meridian of Liang-chau. Crossing the Kuko-Morito range and the depression of Goitso, he reached the desert proper, sparingly covered with sand, forming dunes or "barkhans" running east-south-east. Their northern slope is gently inclined, but the southern steep. Between these there are small oases, where fresh water is found at a depth of 6 feet. Beyond the small fresh-water lake of Kuku-burdu the range of Yabarai, where an apparently new species of *Ovis* was met with, was crossed by a pass of 5400 feet, the route then leading by Sokho-khoto, or Chen-Fan, to Liang-chau. The route taken by Koznakoff led by the lakes Sokho and Gashun-nor and the valley of the Edzin-gol, which were for the first time accurately surveyed. Ladyghin crossed still further west, across the most broken part of the desert. The Tumurten range was found to be well watered, wooded, and abounding in game, recalling, in fact, the Mongolian Altai. This route debouched on Su-chau.

AFRICA.

The North-East Shores of the Victoria Nyanza.—Sir Harry Johnston has communicated to us the decisions recently arrived at by the Uganda authorities as to the nomenclature of various bays and other features on the north-east shores of the Victoria Nyanza. Considerable modifications have been introduced into the

map of this part of the lake by recent surveys, especially those of Commander Whitehouse, of the railway survey, but, until more details are received, it is not easy to grasp the exact character of the discoveries. The bay hitherto known as Ugowe bay will in future be called Kavirondo bay, as the former name is unknown on its shores. It will, Sir H. Johnston says, be applied to "the real Ugowe bay, which is the large shallow inlet to the north of Kavirondo bay, discovered by Stanley in the first instance," but lately rediscovered by Commander Whitehouse. This officer has found that the large island at the mouth of Kavirondo bay is really two islands, and that this bay possesses additional gulfs of its own towards the south. He has also discovered a number of new islands in the northern waters of the lake. Other points of nomenclature are—the tiny inlet at the north-east corner of Ugowe bay will be known as Railway inlet; the projected railway terminus at the corner of this inlet will be called Port Florence, from Mrs. Whitehouse, the wife of the chief engineer; and the adjoining Government station to the north, Kisumu. A steamer belonging to the Uganda Government, the *William Mackinnon*, has at last been launched on the lake, across which she made her first trip in November last. The steamer was built in Glasgow at the instance of the late Sir W. Mackinnon, but was taken over by the Government on the declaration of the Uganda Protectorate. One or two points in the above are not quite clear. By the large island at the mouth of Kavirondo bay, it would seem that Ugingo is intended, so that the name Kavirondo bay would apply to the whole stretch from this island to the most easterly point of the lake. This leaves very little room for an independent bay before Berkeley bay is reached. Stanley, moreover, showed no decided bay, but only a gentle curvature of the coast, between his "Nakidimo creek" (in $0^{\circ} 20' S.$) and Berkeley bay (his "Bay of Manyara"), while the name Ugowe was heard by him south, and not north, of Nakidimo creek, which was evidently some portion of the present Kavirondo bay.

The Name Kenya.—We are informed by Mr. Mackinder that the name Kenya, as to the origin of which a considerable amount of discussion has been held, has lately been found by Captain Hinde to be in actual use among the Wakamba of the Kitui hills, the very district from which Krapf first obtained a view of the mountain fifty years ago, so that the accuracy of that traveller is satisfactorily established. It is curious, as Mr. Mackinder remarks, that a name of such local usage should have become attached to the mountain. It is also somewhat strange that among the names recorded by Krapf, who, while at Kivoi's village in Kitui, made inquiries as to the geography of the countries north, of representatives of various tribes, including people of Kikuyu and north and north-west Ukambani, we do not find either the Kikuyu name Kilinyaga or that of the Wakamba, Njalo (both given by Gregory). The full form was, according to Krapf, Kima ja Kegnia (Mount of Whiteness), others in use being Kirenja and Ndur Kegnia. The traveller also mentioned the Masai (Wakwafi) name Doenyo Ebor under the form Orldoinio Eibor (White mountain). Dr. Kolb, who twice passed through Kitui on the way to the mountain, does not say whether he found the name Kenya in use. He speaks of the central peak as Kilimara, apparently a variant of Kilinyaga.

Exploration of the Southern Shari Basin.—News has lately been received in France of the safe return to Brazzaville of the expedition to the south-west portion of the Shari basin, the organization of which, under MM. Huot and Bernard, was announced in the *Journal* for September last. The expedition seems to have been very successful, and has added materially to our knowledge of the southern Shari basin and adjoining parts of that of the Congo. The February number of the *Bulletin* of the *Comité de l'Afrique Française* contains the account,

with sketch-map, of a preliminary journey by M. Bernard to the basin of the Wom, or Wa, the stream first made known by M. Clozel, which has generally been taken to be a branch of the Logone, though M. Wauters suggested that it might belong to the system of the Ubangi. Starting from the Gribingi station, M. Bernard struck west, and reached various streams flowing north which unite to form the Fafa river. He finally reached a large river called Wa, which had a width of over 200 yards. The country near its banks was inhabited by the Dagbas, who possess short heavy canoes similar to those in use on the Shari. Embarking on the stream, the traveller followed its course to the north-east, as far as a point, in about $7\frac{1}{2}^{\circ}$ N., $18\frac{1}{2}^{\circ}$ E., where it suddenly bends to the north-west. This point was far to the east of the course usually assigned to the Wom, as to the identity of which with the Wa there could, however, be little doubt. M. Bernard therefore came to the conclusion that it must be identical with the Bahr Sara, mentioned by Maistre as one of the three principal branches of the Shari, and even regards it as the main headstream of the latter river. He afterwards traced the river upwards to about $6^{\circ} 45'$ N., in which latitude he was only about 50 miles north of the lowest point on the Wom reached by Perdrizet. The river retained a width of 150 to 200 yards, with a winding and rocky course. It was said to come from a long distance towards the west, and one of the tribes inhabiting its banks in this direction was said to obtain beads from Europeans. The latest news states that the expedition has since surveyed the middle course of the Wom, proving its identity with the Bahr Sara, and afterwards surveying the mountainous zone which separates the basins of the Congo and Shari. The return journey was made in part by the Bali, probably the upper course of the "Likuala aux Herbes," from which the travellers crossed over to the upper Sanga.

Exploration in the Ivory Coast Hinterland.—The first number of *L'Année Géographique* for the present year contains an account of the geographical work done by the expedition of Captain Woelffel, who, with Lieut. Mangin, started from the Sudan for the Ivory Coast at about the time when the Hostains-d'Ollone mission set out in the opposite direction. Captain Woelffel explored a district east of that traversed by Hostains, lying on the headstreams of the Sassandra river, the principal stream of the western portion of the Ivory Coast. Leaving Sigiri on the upper Niger on February 18, 1899, the expedition crossed first the Tankisso, and afterwards the Niger at a point where its width was nearly 2000 yards. Passing Kankan, an important Mussulman centre, it reached Bissandugu, once the capital of Samory, but now sunk to a village of 100 to 150 inhabitants. At Beila, on the water-parting between the Niger and the coast rivers, the final preparations were made, and on resuming its march the expedition passed through Boola—an important market where the Diulas of the Sudan exchange their salt and cloth for the kola nuts brought from the south by the Gerzes—and, crossing the difficult pass of Zaragwe, reached the large Gerze-Manon village of Lola, on the borders of the Guinea forest-zone. Hence expeditions were made to the south-east, to the headwaters of the Diugu, or Kavalli, and Zo, but much difficulty was experienced from the hostility of the natives, by whom constant attacks were made on the party. The return was finally effected by a northerly route across the Bafing and Fereduguba. The length of the new routes surveyed amounted to over 900 miles, and linguistic, photographic, and botanical work was also done. The country presents a great interest geographically, being formed of a series of mountain *massifs*, whence streams descend in all directions, fed by the winter rains, which last more than seven months in the year. In the north (about $8\frac{1}{2}^{\circ}$ N.) the Geye range separates the Niger basin from that of the Fereduguba. In the west it splits up into two chains, which, with others radiating from a mountain-knot in about $8^{\circ} 10'$ N.,

BRITISH RAINFALL ORGANIZATION.

Symons's Meteorological Magazine.

Edited by HUGH ROBERT MILL, D.Sc., LL.D.,

Formerly Librarian to the Royal Geographical Society.

This Magazine originated in 1863 as the one-page **Monthly Rain Circular**, sent by the late MR. G. J. SYMONS, F.R.S., to the observers associated in his newly formed British Rainfall Organization. In 1866 it assumed the name of **Symons's Monthly Meteorological Magazine**, and the size was increased to 8 pp. and ultimately to 16 pp. On the death of Mr. SYMONS in 1900, the Magazine was carried on by his successor, MR. H. SOWERBY WALLIS, who has now been joined in the direction of the British Rainfall Organization by the present Editor.

SYMONS'S METEOROLOGICAL MAGAZINE touches upon all departments of Meteorology and Climatology. In addition to short articles, correspondence and notices of books, each number contains Notes of the Weather of the previous month, with Tables of Rainfall and Temperature for 50 stations and of Rainfall alone for over 100 additional stations in the British Islands, and a Climatological Table of the British Empire, including returns from 18 Indian and Colonial stations. Accuracy is the first care in every statement, and conciseness is enforced by the limited space.

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$8\frac{1}{2}^{\circ}$ W., separate the upper courses of the various coast streams. A little further south the *massifs* of Naba and Kore, the former an enormous block of granite and sandstone, rise to a height of over 7000 feet. Their upper parts are bare and steep, all the surface soil having been washed down to the valleys. East of these the broad upland of Zelekuna, which probably reaches 10,000 feet, is clothed with dense forest, which with the broken nature of its surface, renders it almost impassable. A long chain forms its continuation in the direction of the Fereduguba. The identity of this river (which receives on the left the Tienba, and on the right the Bafing) with the Sassandra, first suggested by Blondiaux, has not yet been demonstrated, but there can be little doubt as to the fact. The next river to the west, the Zo, is said to have a general south-easterly direction, and would seem to belong also to the basin of the Sassandra. In $6^{\circ} 45'$ N. it is over 100 yards wide, and carries a large volume of water in the rains. The Diugu, which rises between the *massifs* of Naba and Kore, was considered by Hostains as the headstream of the Kavalli, but Captain Woelffel is inclined to think the Mani, which rises further west, the larger branch. The limit of the dense forest seems to run from west-north-west to east-south-east, between 7° and 8° N. It abounds in wild animals, but domestic animals become more and more scarce as one proceeds south. The inhabitants are agile and well made, and of a medium height. Their colour is rather bronze than black. Though all of the same race, they speak a variety of languages.

New Capital of the Ivory Coast.—On November 23 last the capital of the French Ivory Coast was transferred from Grand Bassam to Ajame, the step being mainly due to hygienic considerations. The new capital will in future be known as Bingerville, after the explorer who did so much to open up the *Hinterland* of the colony.

Egyptian Public Works in 1899.—The report for 1899 by Sir W. E. Garstin, on the administration of the Egyptian Public Works Department, contains a large amount of information on all matters connected with the irrigation branch of the service. The flood-supply of the Nile was in 1899, it will be remembered, the worst on record, and though from January till June the levels at Aswan were above the mean of previous years, the maximum (on September 4) was 1.23 metre (4 feet) below the average of former years. After September 4 the river fell very rapidly, and at the end of the year the level was 1.75 metre (5.74 feet) below the average. The lowest floods recorded at Aswan were those of 1877 and 1888, so that the flood of 1899 carried on for the second time the sequence of an eleven-year period. Thanks to the careful regulation of the supply, and especially to work done by the barrage, fully made use of for the first time in its history, the loss of crops was surprisingly small. That of cotton was nearly a record one, and the out-turn of sugar-cane and maize was on the whole good. The rice crop was both good and exceptionally large. For the forecast of the flood the river-gauges at various points in the Sudan proved of much value, and interesting results have been obtained as to the time taken by the flood-water to travel from one point to another. Good progress was made during the year with the new weirs below the barrage, with the drainage system of Lower Egypt, and with the works connected with the reclamation of the Wadi Tumilat. In connection with navigation, the chief work was the construction of the Saneta lock on the Mansurieh canal. Borings for water at Medinet El Fayum and Beni Suef were unsuccessful, although at the former the borings were carried 205.7 metres (674 feet) below the surface, or 182.3 metres (598 feet) below mean sea-level. During the year an excellent start with the works for the great Nile reservoirs was made, and at Aswan 97,670 cubic yards of masonry was completed in the

solid portion of the dam, which for a length of 400 yards was brought to within $6\frac{1}{2}$ feet of its full height. The excavation for the foundations was in all cases carried down to the solid rock, this necessitating an unlooked-for amount of work, as the rock underlying the surface-granite consisted largely of decomposed schists with seams of clay. An important work was the closing of three out of five of the deep channels which traverse the line of the work, by temporary dams or "sadds." Equally good progress was made with the weir at Assiut. A special section of the report deals with the work of the Survey department. In the Fayum, to which work had been transferred from Gharbieh, the major triangulation was completed and about two-thirds of the minor triangulation observed. The base-measuring apparatus had been sent to Paris for re-engraving, etc., and was to be compared with the international standards at Sèvres. For the Geological Survey two parties were working in the Sinai peninsula, two in the Fayum and Nile valley. The work in Sinai brought to light many interesting facts in relation to the earth-movements to which the peninsula owes its origin; while the Nile valley between Aswan and Korosko was mapped in detail on the scale of 1:10,000, and a detailed geological survey of the first cataract completed. In the meteorological department arrangements were made for the commencement of systematic observations in 1900, and for the transmission of automatic time signals to the central telegraph station in Cairo, and thence to Port Said, Alexandria, and Suez. The observatory is now in charge of Captain Lyons, the head of the Survey department.

Mr. Weatherley in the Upper Congo Basin.—In a letter to Mr. Alfred Sharpe, dated "Chita, Lake Mweru, September 8, 1900," Mr. Weatherley sketches his plans for an expedition west into the Congo State territory. He proposed to start in a couple of weeks for the Kalumengongo river—such, he says, is the true name of the Lufira—on a visit to the Congo rebels' camp. From the accounts given by an Austrian trader, he considers the Kalumengongo to be a larger stream than the Luapula, and navigable for long distances. Being an Englishman, Mr. Weatherley hoped to get through the rebel country, though most of the Belgian officers are reported to have been killed and some eaten—the fate of all prisoners of war. The most important chief among the rebels is one Yamba Yamba. Before starting on his journey, Mr. Weatherley intended visiting Chienye to view the launch of a small steam-vessel, the first to make its appearance on Lake Mweru.

AUSTRALASIA AND OCEANIC ISLANDS.

Glacial Phenomena in Australia.—Prof. Penck has added another to the lengthening list of classical examples of geomorphological research from his pen, in a paper on the glaciations of Australia, published in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*. Dealing first with the phenomena ascribed to the action of ice during Permo-carboniferous times, the deposits found in different localities in South Australia, Victoria, Queensland, New South Wales, and Tasmania, and the similar deposits occurring in India and South Africa, are described in detail. Assuming a common glacial origin for the deposits, the hypothesis of an ice-cap surrounding a south pole situated in about lat. $23\frac{1}{2}^{\circ}$ S., long. 85° E., is examined, and it is shown that, even supposing the difficulty of explaining such a shifting of the Earth's axis to be got over, it not only fails to find a counterpart in the northern hemisphere or in the changed position of the equator, but it does not satisfy the apparent direction of movement of the southern ice, as deduced from the position and structure of the deposits. Prof. Penck accordingly concludes that either our knowledge of the facts is as yet altogether inadequate, or that some important element has been overlooked, and in reviewing possible lines of further research he fastens upon certain points of peculiar significance. First, the Gondwana beds,

which are closely associated with each of the supposed glacial deposits in Australia, India, and South Africa, are so similar that their flora has been assumed to have spread from a sunken continent in the Indian ocean, but they have recently been identified by Bodenbender in the Argentine Republic—a discovery which does away with the sunken continent, and merely requires connection of each of the present continents with the land of the antarctic. From the nature of certain conglomerates described by Bodenbender, it is surmised that the glacial deposits may also be discovered in South America. Reverting next to the deposits themselves, Prof. Penck draws attention to two features which occur in all three localities. Unlike ordinary boulder-clay, the matrix constantly exhibits a bedded structure, and the boulders and pebbles included in it are scored and *faceted* in an unusual way. Minute comparison shows considerable resemblance to the “pseudo-glacial” phenomena observed in the Nagelfluh, and again—as another example—at Kaltenleutgeben, close to Vienna. While it is scarcely possible to suppose that the deposits are of other than glacial origin, it is essential that each should be carefully examined *in situ* to determine how far it has been modified by other agencies, and especially by pressure. In the second part of his paper, Prof. Penck treats of the Quaternary ice-age of Australia and New Zealand: the evidences of ice-action in New Zealand, Tasmania, and the Australian Alps of New South Wales and Victoria are examined separately with the special purposes of estimating the position of the snow-line, and of ascertaining how far the record is of a real glacial period comparable to that of Europe, or merely of somewhat extended glacier distribution. Comparing the result with the western Pyrenees and the Sierra da Estrella, a region antipodal and exposed to similar climatic conditions, the elevations of the snow-line at the period of maximum glacial action are found to be—

Lat. 43°: Western Pyrenees, 4250 feet; New Zealand Alps, under 3250 feet; difference over 1000 feet.

Lat. 40°–42°: Sierra Segundera—Sierra da Estrella, 4450–4600 feet; Tasmania, under 2950 feet; difference over 1500–1650 feet.

At the present day the snow-line ranges in the Iberian peninsula between 2500 metres and 3100 to 3200 metres, and in New Zealand and Australia between 1800 and 2900 metres, hence the mean change since glacial times, about 1200 metres, is the same in both cases. There is, further, evidence to show that the glacial conditions of Australia and the neighbouring islands bore a relation to the present climate closely resembling in many of its aspects the relation of the climate of the glacial period to that of the present day in Western Europe. The results suggest that the ice-age occurred in both these widely separated regions at the same time, and that it was due to a lowering of the snow-line produced by a common cause, merely superposed on the present climatic *régime*; an hypothesis which, though not yet established, has at least received no contradiction from present research.

Canoe Voyages in the Pacific.—Some striking instances of extended canoe voyages by inhabitants of the Pacific islands are recorded in the *Deutsches Kolonialblatt* for January 15. The voyages were not strictly involuntary, and therefore have no direct bearing on the question of the original peopling of the Polynesian groups, but they are none the less of interest as illustrating the capacity possessed by the islanders of traversing long distances in their frail vessels without any of the scientific aids possessed by civilized navigators. The story comes from Yap, but relates to natives of Ugoi, who, after the typhoon of November, 1898, set out for Fais (east of Yap) in search of a fleet of canoes which had been dispersed by the tempest. Unable to reach their destination, and meeting with no better success in the endeavour to make Yap or the Palaus, they finally sailed west, until

they reached an island named Kiuvan,* in the central portion of the Philippine group. Seven canoes, with a total crew of thirty, eventually made their way to this island, including one which had left Ugoi shortly before the rest. After waiting in vain for the setting in of the west wind, they took in supplies of coconuts and water and set sail, but after beating about for thirty days still saw no sign of land. Uncertain what course to take, they parted company, some trying for the Palaus, others for the Ngoli or Matelotas group, and one for Yap, which was reached nineteen days later, after a voyage, in all, of 2000 nautical miles. Four others subsequently joined the first at Yap, having gained the Matelotas two and a half months after leaving Kiuvan. In answer to inquiries as to the means employed for steering a course in these watery wastes, it was stated that each canoe contained navigators specially trained from boyhood to steer by the stars. The return voyage is of special interest, from the fact that it was against the prevailing current, and that, probably on this account, the Spaniards were long unsuccessful in their attempts to discover the Palaus from the Philippines.

POLAR REGIONS.

The Polar Wolf and Musk-ox in East Greenland.—Dr. Nathorst contributes to the first number of *La Géographie* for the current year a paper on the present and past distribution in Arctic America of the polar wolf and musk-ox. The first of these animals (a variety of *Canis lupus occidentalis*) has, he says, reached the coasts of East Greenland, where its presence was indisputably proved by him in 1899, within quite recent years. In West Greenland, where reports of an animal called *amarok* by the Eskimo have long been current, the existence of the wolf has been also established within recent years, but it still only occurs accidentally on that side. The route by which it has made its way to East Greenland can be traced by the mention of the animal in the narratives of voyages. It has been seen, *e.g.*, on both sides of Robeson channel, by the *Polaris* expedition in 1872, the Nares expedition in 1876, and by Greely in 1881–83. On the north-east coast of Greenland its presence was ascertained both by Astrup and Peary (1892–94) on the shore of Independence bay, so it is evident that it has migrated from the American archipelago across North Greenland and down the east coast. As no traces of wolves had been seen on the latter coast down to the date of Ryder's expedition, which wintered in Scoresby sound in 1891–92, Dr. Nathorst concludes that its arrival there was subsequent to 1892. Already some modification of the fauna seems to have resulted from its presence, especially in the direction of a diminution in the numbers of reindeer, which, though formerly plentiful, were seen in 1899 in comparatively small numbers only. The blue fox seems also to have become less abundant. The musk-ox, so widely distributed in the north in former geologic times, but now limited to a comparatively restricted area in northern North America (shown by Dr. Nathorst in a sketch-map), seems also to have arrived in East Greenland (in modern times) at a comparatively recent date. No remains of the animal are to be found in the "kitchen-middens" dating from the occupation of the country by Eskimo, nor were any specimens seen by explorers in the early part of the century, being first noticed by the German expedition in 1869. The musk-ox must, however, have existed in East Greenland at a very remote period, for single skulls, bearing evidences of great age, have been picked up at two different points on the coast. Dr. Nathorst concludes by pointing out the advantages which might be derived from the domestication of the musk-ox, of

* This seems to be the same name as Guivan, on the island of Samar, a place to which two canoes from the Palau group are said to have been driven in 1696 (see *Pet. Mitt.*, 1890, p. 162).

which a fair number of specimens are now in Europe. Only those in Sweden, however (lately brought back by MM. Kolthoff and Næso), which number in all two males and three females, have an environment similar to that of their natural habitat.

GENERAL.

Influence of the Vegetation of a Country on its Rivers.—A valuable paper on this subject, though itself merely an outline of a more detailed discussion by the same author in the *Vierteljahreschrift des Bayerischen Landwirtschaftsrathes*, appears in the November number of the *Meteorologische Zeitschrift*, from the pen of Prof. E. Wollney, of Munich. The writer begins by pointing out the incompleteness of the methods of inquiry usually followed in reference to the part played by the plant-growth of a country in determining the amount of water carried off by rivers, holding that the true method of approaching the subject is an inductive one, in which the working of each individual factor is separately studied in order to arrive at the combined result. The practical importance of the question is shown by the obvious advantages which arise from the equalization of the flow of rivers—that is, the lowering of the flood-level and the raising of the low-water mark—the latter of which follows as a natural consequence from the former. Unlike many writers, Prof. Wollney does not limit himself to the consideration of forests as a factor in the question, but includes vegetation of all kinds. He traces the influence of a plant-covering on (a) the moisture contained in the soil; (b) the amount of water carried away both above and below the surface; (c) the rate at which such water is carried away; (d) the maintenance of the supply of the rivers. Under this last head he shows that, though a plant-covering might seem at first sight to lower the level both at high and low water, and so fail to produce the required equalization, this is not so in fact, owing to the retention of the water in the soil by plant agency. The second section of the paper deals with the influence of vegetation on the solid matter transported by running water. In this respect forest exercises the greatest effect in reducing the amount of material removed, grass somewhat less, and cultivated crops the least. The general conclusions to be arrived at are three. In the first place, rivers receive a diminished water-supply from areas covered with vegetation, both by reason of the accumulation of the water in the soil beneath the plants, and of the strong transpiration of the latter. Secondly, the rapidity of flow of the water both above and below the surface is lessened by the obstruction offered by the plants and their roots; and, thirdly, the removal of earth from sloping ground is retarded in an extraordinary degree by the compacting influence of vegetation. The measure of the most practical importance for the equalization of the flow of streams in the interest of agriculture, is the preservation of a covering of perennial vegetation in the source region of the rivers. On level ground such a covering is of less importance, except where the soil is so porous as to permit an extensive lateral movement of the water.

The Oxford School of Geography.—The recently issued report for 1900 on the Oxford School of Geography, contains some encouraging features, while at the same time pointing to the need of continued exertions on the part of those interested in the improvement of geographical education in this country before the goal so much to be desired can be considered reached. As regards attendance at the lectures, two points are to be especially noticed. In the first place, while during the Hilary and Michaelmas terms the numbers reached ninety-five and one hundred respectively, in the Easter term they fell to sixteen, showing that comparatively few students are sufficiently in earnest to withstand the various counter-attractions of the summer term. Secondly, of the total attendance in the other two terms, a preponderating proportion (89 and 93 per cent. respectively)

attended one, or at the most two, courses of lectures only, and these entirely on the general or historical sides of the subject. The number of those making special study of geography as a subject in itself is, therefore, still extremely limited—six, four, and five being the respective numbers of those who avail themselves of all the instruction offered, including the important section of practical work in the laboratory or in the field. The list of lectures and other instruction given during the year shows that little is to be desired on the score of efficiency and comprehensiveness of the teaching, and it is only to be hoped that in course of time many more will avail themselves of the valuable facilities placed at their disposal. The year under review being the first in which such effective teaching, with apparatus, was offered, it was not to be expected that all the wishes for results could be immediately attained. The institution of the University Diploma in Geography, candidates for which must have attended a prescribed course of lectures and study at the school, and for which the first examination will be held in June next, will no doubt exercise a beneficial influence in the future. Inquiries addressed to a considerable number of public schools, with a view to ascertaining whether holders of the diploma would be welcomed as teachers, elicited favourable replies from thirty-two public schools for boys, and from twenty-seven high schools for girls. The syllabus issued shows that the standard required will be sufficiently high to give the diploma a real value, candidates being expected to answer papers on general physical and regional geography, as well as on three of a group of more special subjects, such as geomorphology, the history of geography, military geography, etc. As regards equipment, the staff are evidently still at a disadvantage, for although the sum of £120 has been expended in the purchase of the most urgently needed apparatus, this must be quite inadequate to meet the requirements of a thoroughly well-equipped school.

The Geographical Association.—The annual meeting of the Association was held in the hall of the College of Preceptors on January 9, the chair being taken by the President, Mr. Douglas W. Freshfield. The report, read by Dr. J. Herbertson, Honorary Secretary, shows that during the year eight members retired and thirty-seven joined the Association, which is now represented in eighty-four schools. Although, by a resolution carried at the last annual meeting, the Association is now open to all teachers in geography, as yet no elementary school teachers have joined it. A branch has been formed in the city of Melbourne. During 1900 a new catalogue of lantern slides was prepared, and arrangements were made with the Diagram Company for lending the Association's as well as the Company's slides to members for a very small charge. A successful discussion on the teaching of geography was organized at the Cambridge summer meeting. The desirability of starting a journal in connection with the Association having been suggested to the Committee, it has been decided to issue one or two experimental numbers in 1901, provided a sufficient guarantee fund can be raised. Such a journal would discuss the methods of teaching geography, and bring to the notice of teachers the most reliable and valuable information on geographical topics of educational importance. After the reading of the report, the office-bearers were re-elected with the addition of Mr. A. D. Carlisle, of Haileybury, who replaced the late Mr. Harrison of Fettes. Dr. Mill's resignation was intimated with great regret, and he was made an honorary member. The President then showed a series of slides illustrating his recent journey in the Himalaya of Sikkim and Nepal, and brought out in a striking way the great contrasts of scenery which can be observed within a short distance, as the altitude varies from 700 to 28,000 feet. The journey has already been described in the *Journal* (vol. xv. p. 642). Mr. T. G. Roope, H.M. Inspector of Schools, then delivered an address on "Practical Geography."

which was illustrated by specimens of practical work done in schools and on excursions and by a number of wall maps. He pointed out that while the British had done good work as explorers and traders all over the world, they had done little or nothing to advance the study of theoretical geography. The old tradition of catalogues of names, useful perhaps in the sorting department of the Post Office, but otherwise dull and uninteresting and of no educational value, was still too much followed. He then outlined different methods of teaching geography. A full report of his paper will shortly be published by the Geographical Association.

Scientific Expedition to Iceland, Greenland, and Labrador.—Arrangements have, we learn, been made in the United States for a geological and geographical excursion in the North Atlantic, to be carried out in the coming summer under the direction of Dr. R. A. Daly, who, as mentioned in our last number, last year led a party from Harvard University to the Labrador coast. An opportunity will be offered of studying the volcanic and glacial phenomena of Iceland, the fiords and glaciers of western Greenland, and the mountains and fiords of northern Labrador, while independent studies in other branches of science may be made by members of the party. Explanatory lectures on the regions visited will be given from time to time, and, while Dr. Daly will act as guide on the Labrador coast, it is hoped that this office may be performed in Greenland and Iceland by specialists on the geology and physical geography of those countries. Intending members of the party, which is not limited to citizens of the United States, must forward a deposit of \$250, or half of the inclusive fee for each member, before March 15. Application for membership is to be made to Dr. Daly at Harvard University.

OBITUARY.

Colonel Haffner.

COLONEL JOHAN FREDERICK WILHELM HAFFNER, until 1898 President of the Norwegian Geographical Society, died on Sunday, February 17 last, after a protracted illness, aged sixty-five years. In 1855 he joined the army, and rose until he was made colonel in 1891, and retired on account of age in the autumn of 1900. He made surveying his special study, and was, from 1888, chief of the topographical staff of the Norwegian army. In 1864 he also joined the Ordnance Survey Department, and became its director in 1888. During his term of office, the general survey of Norway proceeded rapidly, and the maps issued by the department are admired for their clearness and accuracy. In 1875 Colonel Haffner became a member of the Board of European Survey. In 1895 he represented Norway at the Geographical Congress in London. For a long series of years he was President of the Norwegian Geographical Society, and intimately connected with the formation of Nansen's celebrated polar expedition in the *Fram*. As a reward for his scientific labours he was made Knight Commander of the Order of St. Olaf of Norway, Knight of the Dannebrog of Denmark, St. Anne of Russia, the Crown of Italy, and of the Legion of Honour of France.

Frederick Pattison Pullar.

By JAMES CHUMLEY.

A melancholy interest attaches to the paper on the Scottish Lochs which appears in this number of the *Journal*, owing to the tragic death of one of the authors, Mr. F. P. Pullar, since the papers were passed for press. On February 15, while several hundred persons were skating on Airthrey Loch, in the grounds of

Airthrey Castle, near Bridge of Allan, the ice suddenly gave way, and a number of people were precipitated into the water. Mr. Pullar, who was a strong muscular young man and a powerful swimmer, at once rushed to the rescue of those who were immersed, plunging into the water and floating ice with his skates on. He successfully assisted three of them to land, and then went to the succour of a young lady, who was in an exhausted condition. He was repeatedly urged to save himself by many bystanders; this he refused to do. He supported the young lady for some time, but before help reached them his strength failed, and they both sank, their bodies not being recovered till three-quarters of an hour afterwards. This sad event cast a gloom over the whole district, and great sympathy was expressed for his bereaved parents and only sister, who had just left the ice before the accident occurred. On February 19 he was buried in Logie churchyard, attended by an immense concourse of mourners, and amid every expression of sorrow and sympathy.

Frederick Pattison Pullar was born at Bridge of Allan on December 20, 1875, and was the only son of Laurence Pullar, Esq., of The Lea, Bridge of Allan, and nephew of Sir Robert Pullar, of Perth. In his earlier years he was rather a delicate child, and much of his education was conducted at home under private tutors. Later on his health improved, and his education was continued at Stanley House School, Bridge of Allan, and the High School of Stirling. Afterwards he attended the Glasgow and West of Scotland Technical College, where he exhibited a marked ability for mathematics, mechanics, and applied science generally. He ultimately entered his father's business, but devoted a good deal of his time to scientific pursuits and studies.

About five or six years ago, while cruising in his father's yacht, the *Freya*, he, under the guidance of Sir John Murray, commenced to take an interest in oceanographical observations and problems, and exhibited a lively devotion to the practical work carried on at the Marine Biological Station at Millport. He enthusiastically embraced the study of meteorology, and established at his father's residence at Bridge of Allan a complete meteorological observatory, his instruments including deep-earth thermometers. He became a member of the Royal Meteorological Society, sending in reports regularly to the last-mentioned society during the past five or six years. He presented a complete set of meteorological instruments to the Scottish Hospital which proceeded to South Africa last year under Prof. John Chiene. A room in his father's house was fitted up as his own private workshop, in which he had many ingenious and interesting mechanical, electrical, and photographic contrivances, together with considerable geological collections.

About three years ago, in conjunction with Sir John Murray, he undertook a systematic bathymetrical survey of all the lochs of Scotland, and here his mechanical knowledge and inventive genius was at once exhibited by the improvements he made in the apparatus for taking the soundings. A portable machine was constructed from his designs, which could be firmly and rapidly fixed to the gunwale of the boat from which the soundings were to be taken. He also carried out many improvements in the methods of taking temperatures by means of deep-sea thermometers, in the plungers for procuring samples of the deposits, and in the apparatus for the capture of organisms at intermediate depths. At the time of his death, among other improvements, he had in contemplation the construction of a motor engine which could be applied to the propulsion of both a car and a boat, so that he might carry with him from his home a boat for taking soundings, transfer the engine to the boat, and re-transfer it, when the work was finished, to the car again. The publication of the results of the researches in the Scottish lochs was commenced last year, the first instalment, dealing with the lochs of the Callander and Trossachs district, being published in the *Journal* in April last, and the present number

contains two further instalments, dealing with lochs in the Forth and Tay basins; the survey of some other lochs has been completed, but the results are not yet in a state for publication.

In September last Sir John Murray left for the purpose of carrying out explorations on Christmas island, in the Indian ocean, and it was arranged that the parts in this number should be put into form and passed for press by Mr. Pullar. Sir John Murray returned to London on the evening of February 16, and on arrival at his hotel was handed a telegram announcing the death of his young friend on the previous day. They had made arrangements to devote most of the coming summer to the sounding of the lochs, with a view to a speedy completion of the entire survey; this important work will necessarily be interrupted by Mr. Pullar's lamented death.

Mr. Pullar was elected a Fellow of the Royal Geographical Society in 1896, and he was also a Fellow of the Royal Scottish Geographical Society. Last month he was admitted to the Fellowship of the Royal Society of Edinburgh.

Mr. Pullar was beloved by all who knew him. He was a man of great bodily and mental activity, lively disposition, generous and brave—knowing no fear. His friends were justified in believing that he would have a great future. His promising career has been cut short by an act of devotion. He sacrificed his life in an heroic endeavour to save the life of another.

“ His life was gentle, and the elements
So mix'd in him, that Nature might stand up
And say to all the world, ‘ This was a man ! ’ ”

CORRESPONDENCE.

On the Approaches to Newfoundland and Adjacent Banks, with remarks re Currents, Ice, and Fog.

MUCH has been written about the coasts of Newfoundland and Nova Scotia, and the fogs and currents that prevail there, and many surveys of the outlying banks have been made. Scarcely any of these writings or surveys are of recent date, and are suited more particularly to the more leisurely epoch of the sailing vessel. It may not be out of place to review some of the incidents and facts connected with the passage of a steamer between the British Isles and America *viâ* Cape Race, Newfoundland (the shortest route).

When approaching the rugged and bold coast of Newfoundland in foggy weather, which is too frequent unfortunately, there is nothing to guide the mariner but the soundings, and these are of a character to be of little use, owing to their sameness, except in the vicinity of “Ballard” bank, where the water shoals quickly from 80 fathoms to 9 and 15 fathoms *on* the bank, and then deepens to about 30 fathoms, which depth is carried close to the shore. Further north, towards Cape Broyle, soundings of 80 fathoms can be found from close proximity to the shore to a distance of 50 miles to eastward, with varying kinds of bottom, which I have seldom found to compare with that marked on the charts. The French surveys of 1839 and 1856 are largely responsible for the soundings and description of bottom shown on our Admiralty Charts, with corrections by British surveys in 1880, 1895 and 1897. Several shoal spots are shown on the “Grand” and Sable banks, the existence of which is doubtful, notably the 5-fathom patch off south coast of Newfoundland in lat. $45^{\circ} 45' 30''$ N., long. $54^{\circ} 19' 30''$ W., which in itself would constitute a grave source of danger, as many large steamers pass that locality drawing 28 to 30 feet. During many voyages I have

tried to find this 5-fathom patch, when the sea was smooth, and although I have been quite sure of my position on many occasions, I have always found 48 fathoms instead of 5 fathoms, and a sandy bottom instead of mud.

Many times, both in clear weather and fog, when I have been sure of my position (and when I have been uncertain), have I ran "lines of soundings" by Lord Kelvin's machine every 15 minutes for several hours, and I have found them unsatisfactory generally, except that they inform one whether there is sufficient water under the ship or not. In these days of rapid ocean transit, it would be an unspeakable boon to have these banks thoroughly surveyed, with a view to enabling the mariner to at least approximate his position by soundings in this fog-clad region, and thereby expedite his safe arrival in port.

Current of varying strength is the next thing to be considered, and of which there can be less accuracy of report than in soundings. It can, however, be taken on general lines that the arctic current, which carries down such immense bodies of ice yearly, diffuses one part of itself round Cape Race in a south-westerly direction, and continues in this way over the "banks," often close to the shores of New Jersey. A little further south, and often close to the "line of soundings," the influence of the Gulf Stream is felt, but seldom with much strength. The proximity, however, of the hot and cold waters have enabled me to witness on many occasions the curious phenomenon of streaks of vapour rising from the surface of the ocean almost with the regularity of arrangement of furrows in a field, caused no doubt by the intermingling of jets of hot and cold water, or the over-running of a stratum of warm water. This steam or vapour often becomes so dense that it is fog in earnest.

This is one cause of fog I can vouch for, other causes are not so patent. The idea of hot atmospheric waves travelling north and coming in contact with the colder air, thus causing condensation and fog, or the evaporation from the warm water of the Gulf Stream being condensed by the cold winds and causing fog, is not easily grasped by every person when the temperature of sea and air do not vary more than 2° Fahr. Then, again, there are a variety of fogs, some wet and some dry, and varying in density, and, considering the different directions the wind may be blowing from during the existence of these fogs, it renders theories conflicting and hard to understand. Naturally, when the temperature of sea and air is practically similar, the conditions which produce the fog exist elsewhere.

Ice is the next thing to be discussed. This every one knows constitutes a great danger to shipping, both in the northern and southern hemispheres. It is a matter of very general belief that the thermometer will warn you of your approach to ice, and many ancient writers propound this theory. My experience, ranging over sixteen years in the Atlantic trade, experimenting at every opportunity, teaches me that in the case of being to leeward of a vast field of ice, the temperature of sea-surface, and air especially, may be found colder to a distance of a mile or two; but in the case of bergs, no perceptible difference will be noticed until too close to avoid collision if the vessel be moving even slowly through the water. Many times I have taken temperatures of sea and air as soon as I sighted an iceberg, and did so every ten minutes until within a quarter of a mile of it, and I found no change whatever. Another time I sighted icebergs a long way off, and noted temperatures, and in the course of four or five hours I had passed forty-five of them, varying from 1 to 7 miles distant, and the temperature did not at any time indicate their presence. Ice-blink *will* sometimes reveal the vicinity of these dread enemies of shipping, but nothing else that I am aware of while fog prevails.

H. MAGILL,

Ballymenoch Park, Holywood, co. Down.

Captain ss. *Lord Devonshire*.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

ELECTIONS, JANUARY 28, 1901.

Alfred Baldwin, M.P. ; Captain George Howard Bretherton, D.S.O. ; Rev. Charles William Hamilton Dicker ; Captain L. D. Fraser, R.A. ; Charles Henry Haines, M.D. ; John Frank Jones ; William Jump ; J. A. Leavitt, D.D. ; Captain Lloyd-Philipps, 1st Life Guards ; Montes de Oca Manuel Augusto ; Wordworth Poole, C.M.G., Physician to H.M.B. Legation, Peking ; Valentin Virason ; Henry Wellington Wack ; Charles Richmond Weld, LL.D.

MEETING IN COMMEMORATION OF THE REIGN OF HER LATE
MAJESTY QUEEN VICTORIA, EMPRESS OF INDIA, PATRON
OF THE SOCIETY, FEBRUARY 11, 1901.

Sir CLEMENTS MARKHAM, K.C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Frank M. Birch ; William Cassap ; Stanley Everard Clay ; James W. Davidson ; Major Colin Harding, C.M.G. ; George Humphrey ; Captain Langdale, R.N. ; Major Anthony Hickman Morgan ; Lord Oxmantoun ; Walter Thornton.*

PROGRAMME.

1. The PRESIDENT: On Her Majesty's Connection with the Society and Interest in Geography, and on Polar Exploration during the Queen's Reign.

2. Right Hon. Sir GEORGE TAUBMAN GOLDIE, K.C.M.G.: Progress of Exploration and the Spread and Consolidation of the Empire in America, Australasia, and Africa.

3. Colonel Sir THOMAS H. HOLDICH, K.C.I.E., C.B.: Advances in Asia, and Imperial Consolidation in India.

4. The PRESIDENT: King Edward VII.

There was an Exhibition of Portraits of the Society's Presidents, and of the leading British Explorers, during Her Majesty's Reign.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
O. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.

Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

- Alps.** *C. Rd.* 131 (1900): 1100-1102. **Lugeon.**
 Prix Gay. Appliquer à une région de la France, on à une portion de la chaîne Alpine, l'analyse des circonstances géologiques qui ont déterminé les conditions actuelles du relief et de l'hydrographie. Par M. Maurice Lugeon.
 Summary of a paper in which the author develops a theory of the origin of the Alpine valleys.
- Holland.** *B. American G.S.* 32 (1900): 308-321. **Griffis.**
 The Heaths and Hollows of Holland. By W. Elliot Griffis.
 On the geographical evolution of Holland.
- Iceland.** *J. Manchester G.S.* 16 (1900): 115-148. **Newby.**
 Iceland and the Icelanders. By J. R. Newby. *Map and Illustrations.*
 Notes collected during two autumn visits to Iceland.
- Mediterranean—Cyprus.** *Quarterly J. Geolog. S.* 56 (1900): 745-758. **Bellamy.**
 A Description of the Salt-Lake of Larnaca, in the Island of Cyprus. By C. V. Bellamy. *With Maps.*
- Norway.** **Boyesen.**
 A History of Norway from the Earliest Times. By Hjalmar H. Boyesen. With a New Chapter on the Recent History of Norway, by C. F. Keary. [The Story of the Nations.] London: T. Fisher Unwin, 1900. Size 8 × 5½, pp. xxxii. and 572. *Maps and Illustrations. Price 5s. Presented by the Publisher.*
 The present is a re-issue for the Story of the Nations Series of Boyesen's 'Norway,' brought up to date by Mr. C. F. Keary after the author's death. The important part in geographical discovery played in old times by the adventurous Northmen, and by their modern representatives in our own day, renders the history of their country of unusual interest to geographers. The early voyages to America are, of course, only briefly touched upon, but the causes, geographical and others, which tended to promote a spirit of hardihood which had its outcome in such voyages, are well brought out. The author has given special prominence to the dramatic phases of historical events.
- Norway and Sweden—Lapland.** *J. Manchester G.S.* 16 (1900): 106-114. **Cowan.**
 Across the Lapland Alps. By E. W. Cowan. *With Sketch-map and Illustrations.*
 Description of a journey from Bodo to the head of the Skjerstad fjord and across the mountains to Lake Säggat, Jokkmokk, and Boden.
- Russia.** *B.S.G. Lille* 34 (1900): 277-286. **Lefebvre.**
 Promenade en Russie. Par M. Napoléon Lefebvre.
 A concise sketch of the main features of Russian geography.
- Russia—Eastern Trade.** *Kolon. Z.* 1 (1900): 342-345. **Rabe.**
 Russlands Meerespforten und seine Etappenstrassen nach Indien und Ostasien. Von Rudolf Rabe. *With Illustrations.*
- Russia—Kalmuck Steppe.** *Deutsche Rundschau G.* 23 (1900): 97-108. **Rossmässler.**
 Reise durch die Kalmückensteppe. Von F. Rossmässler. *With Illustrations.*
- Russia—St. Petersburg.** **Michell.**
 Trade of Consular District of St. Petersburg for the year 1899. Foreign Office, Annual No. 2535, 1900. Size 9½ × 6, pp. 44. *Price 2½d.*
- Spain—Gibraltar.** **Jackson.**
 Gibraltar. Report for 1899. Colonial Reports, Annual No. 305, 1900. Size 9½ × 6½, pp. 24. *Price 1½d.*
- Spain—Historical.** *B.S.G. Madrid* 42 (1900): 97-102. **Blázquez.**
 El teatro de la guerra de Munda. Por D. Antonio Blázquez.
 On the geography of Cæsar's campaign against the Pompeians in Southern Spain.
- Spain—Time.** *B.S.G. Madrid* 42 (1900): 163-168. —
 La Hora de la Europa occidental en España. Real decreto de 26 de Julio de 1900.
- Turkey.** —
 Turkey in Europe. By Odysseus. London: Edward Arnold, 1900. Size 9 × 6, pp. 476. *Maps. Price 16s. Presented by the Publisher.*
 This book is made up of papers written at various periods, but possessing a

certain unity as being all the result of a lengthened study of the real condition of Turkey and the causes to which that condition is due. The author, whose name does not appear, but who possesses an intimate acquaintance with Turkey and neighbouring countries, brings to his task a considerable amount of shrewd insight into the bearing of the facts observed, and the work should be of real value to all who wish to obtain a grasp of the factors which affect the problem of the near East. The writer considers that the errors of those who have dealt with Turkey arise from their failing to realize the fact that Turkey is quite unlike any other country in Europe.

Turkey. *M.G. Ges. Wien* 43 (1900): 231-236. **Oestreich.**

Vorläufige mittheilung über eine zweite Reise in die europäische Türkei. Von Dr. Karl Oestreich.

A short account of the journey referred to in the *Journal* for February, 1900 (p. 174).

United Kingdom. *Met. Record* 19 (1899): 49-68. **Marriott.**

Monthly Results of Observations made at the Stations of the Royal Meteorological Society, with Remarks on the Weather for the Quarter ending December 31, 1899. By William Marriott. *With Map.*

United Kingdom—England—Rainfall. **Marriott.**

Quarterly J.R. Meteorolog. S. 26 (1900): 273-280.

Rainfall in the West and East of England in relation to Altitude above Sea-level. By William Marriott. *With Diagrams.*

United Kingdom—England—Sussex. **Brabant.**

Sussex. By F. G. Brabant, M.A. Illustrated by Edmund H. New. London: Methuen & Co., 1900. Size 6½ × 4, pp. xii. and 298. *Map and Illustrations.* Price 3s. *Presented by the Publishers.*

A most handy and compact guide to the county of Sussex, forming one of a series which is to deal eventually with all the English counties. In the introduction of 44 pages, the author gives a general account of the physical features, distribution of population, industries, history, etc., of Sussex, while in the body of the work the principal places are described in alphabetical order. The little book is tastefully got up, and the illustrations, from line-drawings by Mr. E. H. New, are much superior, from an artistic point of view, to many of the process reproductions so much in vogue at the present day.

United Kingdom—Ireland. *P.R. Irish A.* 6 (1900): 37-78. **O'Reilly.**

The Milesian Colonization considered in relation to Gold Mining. By J. P. O'Reilly.

The writer thinks it probable that the Milesians brought the knowledge of gold-mining to Ireland from Spain in 1044 B.C.

United Kingdom—Ireland. *P.R. Irish A.* 6 (1900): 100-180. **Westropp.**

The Churches of County Clare, and the Origin of the Ecclesiastical Divisions in that County. By T. J. Westropp. *With Map and Plates.*

United Kingdom—Ireland—Donegal. *Quarry* 5 (1900): 583-594. —

The Mineral Industry of the United Kingdom—X. Donegal. *With Map and Illustrations.*

United Kingdom—Scotland. *P.R. Irish A.* 6 (1900): 26-32. **Kinahan.**

The Beaufort's Dyke, off the coast of the Mull of Galloway. By G. H. Kinahan. *With Chart.*

ASIA.

Afghanistan and Baluchistan. **Holdich.**

An Orographic Map of Afghanistan and Baluchistan. By Colonel Sir T. H. Holdich, K.C.I.E., C.B. (From the *Geographical Journal* for November, 1900.) Size 10 × 6½, pp. 6. *Map.*

Ceylon. **Thorburn.**

Ceylon. Report for 1899. Colonial Reports, Annual No. 307, 1900. Size 9½ × 6, pp. 40. Price 2½d.

The value both of imports and exports showed a marked increase in 1899 as compared with 1898. Plumbago-mining was very active. Tea exports reached almost 130 million lbs., an increase of 10 million. Rubber is being planted. The estimated population at the end of 1899 was 3,189,293. A high death-rate is accounted for by an unprecedented outbreak of malarial fever in the northern provinces.

Ceylon Tea.**Ferguson**

The Rise of the Planting Enterprise and Trade in Ceylon Tea, by John Ferguson. Kandy: Published by the Planters' Association of Ceylon, 1900. Size $5\frac{1}{2} \times 4\frac{1}{2}$, pp. 38.

China.**Reclus.**

Élisée Reclus. La Chine et la Diplomatie européenne. Paris: Éditions de l'Humanité Nouvelle, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. *Presented by the Author.*

The author, as might be supposed, is a severe critic of European methods in China.

China—Chefu.*Petermanns M.* 46 (1900): 191-192.**Anz.**

Tschifu und Umgebung. Briefliche Mitteilung von Walter Anz. *With Map and Plan.*

China—Medical Reports.

China. Imperial Maritime Customs. 1.—Special Series: No. 2, Medical Reports, for the half-year ended 31st March, 1900. Shanghai; London: P. S. King & Son. 1900. Size 11×9 , pp. vi. and 18. *Illustration. Presented by the Inspector-General of Chinese Customs.*

Eastern Asia.**Krausse.**

The Far East, its History and its Question. By Alexis Krausse. London: Grant Richards, 1900. Size 9×6 , pp. xvi. and 372. *Maps. Price 18s. Presented by the Publisher.*

A useful summary of the history of Eastern Asia in its relations with Western civilization, preceded by a brief outline of the early history of the countries in question and of the geographical factors bearing on the political questions which await solution. These are fully discussed, the writer pointing out the inadequacy of British methods to counteract the growing influence of Russia. A series of maps illustrates the distribution of foreign interests in China, the railways open or planned, the territories hitherto absorbed by foreign powers, and other points of interest. There is a full chronological table of important events, a reprint of the text of treaties and conventions between the various Powers, and a comprehensive list of authorities.

Eastern Asia—Morphology.**Richthofen.**

Ueber Gestalt und Gliederung einer Grundlinien der Morphologie Ost-Asiens. Von Ferdinand von Richthofen. (Sitzb. A. W. Berlin, xi., 1900.) Size 10×7 , pp. 38. *Presented by the Author.*

An important paper on the tectonic lines of Eastern Asia.

India.

List of Proceedings, etc., India, 1834-1858. Preserved in the Record Department of the India Office, London. London, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 60.

The proceedings are classified under the headings "Political," "Public Works," etc., but no further details of the subjects treated of are given.

Japan—Earthquake.*Petermanns M.* 46 (1900): 249-255.**Yamasaki.**

Das grosse japanische Erdbeben im nördlichen Honshū am 31. August 1896. Von Dr. N. Yamasaki. *With Map.*

Japan—Steamship company.**Laguérie.**

A travers le Monde, Tour du Monde 6 (1900): 377-380.

La Marine Japonaise. La "Nippon Yusen Kwaisha." Par M. Villetard de Laguérie. *With Illustrations.*

On the great Japanese steamship company, and the lines of steamers.

Korea.*B. American G.S.* 32 (1900): 322-327.**Hulbert.**

Korea's Geographical Significance. By Homer B. Hulbert.

The writer lays stress on the ethnological no less than strategic importance derived by Korea from its geographical position.

Malay Archipelago—Java—Batavia.**De Haan.**

Tijds. Indische Taal-, Land- en Volkenk. 42 (1900): 567-583.

Uit Oud-Batavia: Kota-Tahi. Door Dr. F. De Haan. *With Plan.*

On the old fort Hollandia, in Batavia.

Pamirs—Radiation.*C. Rd.* 131 (1900): 879-880.**Stankewitch.**

Mesures actinométriques à Pamir. Note de M. B.-W. Stankewitch.

The observations on solar radiation here recorded were made during the summer of 1900.

Russia in Asia.**Krausse.**

Russia in Asia, a Record and a Study, 1558-1899. By Alexis Krausse. Second Edition. London: Grant Richards, 1900. Size 9 × 6, pp. xxx. and 412. *Maps.* Price 10s. net. *Presented by the Publisher.*

This is a second edition, with few alterations, of the work first published in 1899. It is a useful, though concise, account of Russian enterprise in Asia from the time of Yermak downwards. The portions which deal with Siberia are of special value, from the scarcity of English historical books on the subject, Mr. Ravenstein's 'Russians on the Amur' being practically the only previously available work of the kind. In his list of authorities, the author makes no allusion to Muller's important work.

Russia—East Siberia. *Meteorolog. Z.* 17 (1900): 116-124.

Woeikof.

Mitteltemperaturen von Ostsibirien. Von A. Woeikof.

The observations here summarized, which relate to a long series of years, were brought together from the original sources by M. Tsvitzsky, who records, among other data, the temperature of each month for the years 1876-1895.

Straits Settlements.**Egerton.**

Straits Settlements. Report for 1899. Colonial Reports, Annual No. 304, 1900. Size 9½ × 6, pp. 28. Price 2d.

The total external trade (apart from specie) has increased by 62 per cent. since 1895, by 32 per cent. since 1897, and by 16 per cent. since 1898. The total imports in 1899 reached £24½ million, and the exports £21½ million. Imports from the United Kingdom increased 2½ per cent. in 1899 in spite of a decrease in cotton piece goods, chiefly in favour of Asiatic countries. The low price of Liberian coffee is restricting cultivation, but a greatly increased production of tin in the federated Malay States was expected in 1900.

Tonkin and China.*C. Rd.* 131 (1900): 966-969.**Leclère.**

Sur la continuité tectonique du Tonkin avec la Chine. Note de M. A. Leclère. *Map.*

The author's geological investigations in Kwei-chau, Kwang-si, Yunnan, and Tonkin lead to the conclusion that the Hu-kwang tectonic arc defined by Richthofen is continued without deviation to the mouth of the Song-ka.

Turkey—Earthquake. *M.G. Ges. Wien.* 43 (1900): 221-230.

Schaffer.

Das Maeanderthalbeben vom 20. September 1899. Von Dr. Franz Schaffer.

Western Asia.**Barthold.**

Russische Arbeiten über Westasien. Jahresbericht für 1899. Von W. Barthold. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. III. Zweite Abth. Pp. 218-236.) Berlin and Stuttgart: W. Spemann, 1900.

A useful summary of the contents of the principal Russian publications on Western Asia in 1899.

Western Asia.**Yate.**

Khurasan and Sistan. By Lieut.-Colonel C. E. Yate. Edinburgh and London: W. Blackwood & Sons, 1900. Size 9 × 6, pp. xii. and 442. *Map, Plan, and Illustrations.* Price 21s. *Two copies, one presented by the Author, the other by the Publishers.*

In this important work, Colonel Yate carries the description given in his 'Northern Afghanistan' further west into Persia on the basis of journeys carried out in 1893-98. He describes the time spent by him in the little-known country of the Goklan and Yamut Turkomans, and discusses many questions of interest relative to trade, railway communication, etc. Accounts are also given of a trip to the previously unvisited source of the Gurgan river, and a visit to the turquoise-mines of Madan.

AFRICA.**British Central Africa.****Sharpe.**

Trade and General Condition of the British Central Africa Protectorate for the Financial Year 1899. Foreign Office, Annual No. 2497, 1900. Size 9½ × 6½, pp. 40. Price 2½d.

See note in *Journal*, vol. xvi. p. 475.

British East Africa.**Marsden.**

Trade and Customs Revenue of the East Africa Protectorate for the year 1899. Foreign Office, Annual No. 2536, 1900. Size 9½ × 6½, pp. 18. Price 1½d.

The revenue for 1899-1900 shows a satisfactory increase of 7 per cent., the shipments of ivory have doubled, and those of rubber show an advance of 40 per cent.,

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though still far below the producing power of the country. A direct line of steamers between London and Mombasa is greatly needed.

British South Africa.

Gell.

The Rubber Industry in the British South Africa Company's Territories. By P. Lyttelton Gell. London: British South Africa Co., 1900. Size $8\frac{1}{2} \times 6\frac{1}{2}$, pp. viii. and 28. *Presented by the British South Africa Co.*

Immediate legislation for the regulation and protection of the rubber industry is advocated, as well as the establishment of a scientific department of forestry.

British South Africa.

Hensman.

A History of Rhodesia, compiled from official sources. By Howard Hensman. Edinburgh and London: W. Blackwood & Sons, 1900. Size $8 \times 5\frac{1}{2}$, pp. xx. and 382. *Map. Price 6s. Presented by the Publishers.*

A useful summary of the principal facts connected with the origin and development of Rhodesia as a British possession. The history of the country before 1888 is very briefly touched upon. The total out-turn of gold from November, 1891, to June, 1900, is given as 125,662 ounces.

French Sahara—Adrar. *Ann. G. 9 (1900): 458-462.*

[Dersims.]

La Mission Paul Blanchet.

See note in *Journal* for January, *ante*, p. 72.

French West Africa—Dahomey.

Brunet and Giethlen.

Exposition Universelle de 1900.—Les Colonies Françaises. Dahomey et Dépendances. Historique général, Organization, Administration, Ethnographie, Productions, Agriculture, Commerce. Par L. Brunet et Louis Giethlen. Paris: A. Challamel, 1900. Size $9\frac{1}{2} \times 6$, pp. xii. and 544. *Map and Illustrations. Price 5s. 8d.*

This is the best account we yet possess of the general history and geography of Dahome. The ethnography, productions, industry, commerce, etc., are treated of in separate sections. The map—by the author of the recently published atlas of the French colonies—is very clear, though the scale employed (1:3,700,000) involves the use of somewhat small lettering.

French West Africa—Senegal.

Lasnet, Chevalier, Cligny, Rambaud.

Exposition Universelle de 1900.—Les Colonies Françaises. Une Mission au Sénégal. Ethnographie, Botanique, Zoologie, Géologie. Par MM. Dr. Lasnet, Aug. Chevalier, A. Cligny, Pierre Rambaud. Paris: A. Challamel, 1900. Size $9\frac{1}{2} \times 6$, pp. 348. *Map and Illustrations.*

This valuable work gives the results of the "Mission Économique du Sénégal, 1899-1900. The information it contains on the native races of Senegal is particularly full and complete. Other sections treat of the flora and fauna, especially from an economic point of view, and the work concludes with a short account of the hydrography and geology, including the mineral resources.

French West Africa—Senegal.

Exposition Universelle de 1900. Les Colonies Françaises. Le Sénégal. Organisation politique, Administration, Finances, Travaux publics. Paris: A. Challamel, 1900. Size $9\frac{1}{2} \times 6$, pp. 430. *Maps and Plans.*

This work contains a large amount of useful statistical information on the administration, commerce, agriculture, etc., of the French colony of Senegal. There are special maps of St. Louis and its environs, and of the zones of cultivation of ground-nuts, the export of which reached a value of £480,000 worth in 1899.

German East Africa. *Deutsche Rundschau G. 23 (1900): 129-132.*

Andresen.

Die wirtschaftliche Entwicklung Deutsch-Ostafrikas. Von P. Andresen.

On the resources and prospects of German East Africa.

German East Africa—Language.

Spiss.

Kihehe-Wörter-Sammlung. Kihehe-Deutsch und Deutsch-Kihehe. Von P. Cassian Spiss, o.s.b. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 114-190.) Berlin and Stuttgart: W. Spemann, 1900.

German East Africa—Language.

Velten.

Kikami, die Sprache der Wakami in Deutsch-Ostafrika. Von C. Velten. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 1-56.) Berlin and Stuttgart: W. Spemann, 1900.

German East Africa—Place Names.**Müller.**

Erklärung einiger ostafrikanischer Ortsnamen. Von Franz Müller. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 208–210.) Berlin and Stuttgart: W. Spemann, 1900.

The names dealt with are those of places in the coast-lands of German East Africa.

German South-West Africa—Ethnology.**Brincker.**

Charakter, Sitten und Gebräuche speciell der Bantu Deutsch-Südwestafrikas. Von Dr. P. H. Brincker. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii., Dritte Abth., pp. 66–92.) Berlin and Stuttgart: W. Spemann, 1900.

German South-West Africa—Terminology.**Dove.**

Geographische Bezeichnungen in der Namasprache. Von Dr. K. Dove. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii. Dritte Abth. Pp. 57–65.) Berlin and Stuttgart: W. Spemann, 1900.

On the geographical terminology employed in the Nama language.

German West Africa—Togoland.**Preil.**

Deutsche Kolonialzeitung 17 (1900): 549–550, 566–567.

Eine Otifahrt. Von Oberleutnant Preil. *With Map and Illustrations.*

On a survey of the upper Oti, Togoland, in 1899.

German West Africa—Togo.**Seidel.**

Deutsche Rundschau G. 23 (1900): 14–20, 117–125.

Nord-Togo oder der deutsche Sudan. Von H. Seidel.

A clear sketch of the physical geography of Northern Togoland.

Madagascar—Agriculture. Questions Dipl. et Colon. 10 (1900): 540–548.**Gautier.**

L'agriculture européenne à Madagascar. Par E. F. Gautier. *With Map.*

The writer sketches the present state of agriculture in Madagascar, showing the disadvantages under which it suffers from the want of co-operation between private and public effort. Another great obstacle arises from the fact that the fertile regions are in one part, and the labour supply in another.

Madagascar—Ethnology. B. American G. S. 32 (1900): 297–307.**Hunt.**

Madagascar. By W. H. Hunt.

This paper deals chiefly with the ethnology of Madagascar, but contains notes on recent topographical work. The writer insists that the basis of the population of the whole island is Oriental.

Mauritius and Rodrigues.**Bower.**

Mauritius and Rodrigues. Reports for 1899. Colonial Reports, Annual No. 302, 1900. Size 9½ × 6, pp. 64. Price 3½d.

The financial position of the colony at the end of 1899 is said to have been full of hope, apart from the anxiety caused by the plague. The war in the Philippines has given an impetus to the fibre industry, and 1899 was also a good year for sugar.

Sahara.

Rev. Française 25 (1900): 645–647.

Foureau.

De l'Aïr à Zinder. Mission Foureau-Lamy. Par F. Foureau.

A reprint of M. Foureau's letter to the Paris Geographical Society.

Tunis.

Ann. G. 9 (1900): 434–455.

Pervinquière.

La Tunisie centrale. Esquisse de géographie physique. Par L. Pervinquière. *With Illustrations.*

Tunis—Colonization. B.S.G. Com. Havre 17 (1900): 27–38, 65–90.**Saurin.**

L'Invasion sicilienne et le peuplement Français de la Tunisie. Par Jules Saurin.

The author points out the increasing emigration of Italians to Tunis, and urges the importance of the introduction of French agricultural settlers.

NORTH AMERICA.**Alaska—Mount St. Elias.****Vedova.**

G. Dalla Vedova. La salita sul Monte di S. Elia nell' Alaska. (Estratto dalla *Rivista d'Italia*, fasc. 1, 1900.) Roma, 1900. Size 9½ × 6½, pp. 14. *Presented by the Author.*

Review of Dr. de Filippi's work on the ascent of St. Elias.

Canada—Alberta and British Columbia.**McEvoy.**

Report on the Geology and Natural Resources of the country traversed by the Yellow Head Pass route from Edmonton to Tête Jaune Cache, comprising portions of Alberta and British Columbia. By James McEvoy. (Geological Survey of Canada. Part D, Annual Report, vol. xi.) Ottawa, 1900. Size 10 x 6½, pp. 44. *Map and Illustrations. Presented by the Geological Survey of Canada.*

The route of the exploration here described led from Edmonton to Brulé lake, on the Athabasca, over a rolling wooded plain, and thence westward through high rugged mountains traversed by low valleys.

Canada—Ethnology. P. and T.R.S. Canada 5 (1899) (Sec. ii.): 199-211. Lighthall.

Hochelagans and Mohawks, a Link in Iroquois History. By W. D. Lighthall.

The author brings forward facts in support of the theory that the Mohawks of the Iroquois confederation were, in part at least, the ancient race found settled at Hochelaga by Cartier in 1535, but which had completely disappeared in 1608.

United States—Coal.

Special Consular Reports. Foreign Markets for American Coal. Vol. xxi. part i. Washington, 1900. Size 9 x 6, pp. 312.

United States—Montana.**Pearce.**

Mining and Metallurgical Industry in Butte District, Montana. Foreign Office, Miscellaneous, No. 541, 1900. Size 9½ x 6½, pp. 10. Price 1d.

United States—Washington—Mt. Rainier.**Van Trump and others.**

Mazama 2 (1900): 1-40.

Mount Rainier. By P. B. Van Trump. The Geology of Mount Rainier. By G. Otis Smith. Rainier. By E. T. Parsons. Professor McClure's Report. *With Map and Illustrations.*

The first paper gives an account of early attempts on Mount Rainier, and the first successful ascent by the writer and General Stevens in 1879.

CENTRAL AND SOUTH AMERICA.**Andes. XVII. Jahresh. G. Ges. Bern (1898-1899): 161-178.****Wehrli.**

Reisebilder aus den Anden. Von Dr. Leo Wehrli. *With Illustrations.*

The section of the Andes here described is that cut by 41° S. lat.

Argentine Republic.**Klett.**

Estudios sobre producción, comercio, finanzas é intereses generales de la República Argentina. Por Carlos Lix Klett. Con una Introducción de Enrique M. Nelson. 2 vols. Buenos Aires, 1900. Size 10½ x 7½, pp. xxxii., 1696, and xlv. *Maps and Illustrations. Presented by the Author.*

An exhaustive study of questions relating to Argentine industries, commerce, etc., which should prove of much value for purposes of reference.

Argentine Republic.

Anuario de la Dirección General de Estadística Correspondiente al Año 1899.

Tomo i. Buenos Aires, 1900. Size 10½ x 7½, pp. xviii. and 534.

Bahamas.**Churchill.**

Bahamas. Report for 1899. Colonial Reports, Annual No. 268, 1900. Size 9½ x 6½, pp. 48. Price 2½d.

It is estimated that the area in the Bahamas under Sisal hemp (*Agave sisalana*) cultivation now exceeds 14,000 acres.

Brazil. XVII. Jahresh. G. Ges. Bern (1898-1899): 147-160.**Mann.**

Kreuz und quer durch Brasilien. Von Carl R. Mann.

Based on previously published works.

Costa Rica and Colombia. Petermanns M. 46 (1900): 255-261.**Seler.**

Die Grenzstreit zwischen den Republiken Costarica und Columbia. Von Prof. Dr. Ed. Seler. *With Map.*

The map shows the frontier as defined by the award of the arbitrator as well as the extreme claims of both parties.

Peru—Handbook.**Cisneros and Garcia.**

Guía ilustrada de Lima, el Callao y sus alrededores. Por Carlos B. Cisneros y Rómulo E. Garcia. Lima, 1898. Size 8½ x 5½, pp. 214 and xxx. *Illustrations.*

Peru—Irrigation.**Moreno.**

Perú. Las irrigaciones de la Costa. . . . Por Federico Moreno. Lima, 1900.
Size 8 × 6, pp. 226.

Strait of Magellan and Tierra del Fuego.**Chaigneau.**

Derrotero del Estrecho de Magallanes i de la Tierra del Fuego. Por J. Federico Chaigneau. Valparaiso, 1900. Size 10 × 7, pp. 242.

Uruguay.**Hervey.**

Trade of Uruguay for the year 1899 and part of 1900. Foreign Office, Annual No. 2538, 1900. Size 9½ × 6½, pp. 12. Price 1d.

West Indies—Bahamas.**Churchill.**

Bahamas. Notes on the Planting of the Pita Plant (*Agave Sisalana*) and the extraction and preparation of the fibre. Colonial Reports, Miscellaneous, No. 14, 1900. Size 10 × 6½, pp. 8. Price ½d.

West Indies—Dominican Republic.**Gosling.**

Trade of the Dominican Republic for the year 1899. Foreign Office, Annual No. 2537, 1900. Size 10 × 6½, pp. 8. Price ½d.

West Indies—Hayti.**Prichard.**

Where Black rules White. A Journey across and about Hayti. By Hesketh Prichard. London: A. Constable & Co., 1900. Size 10 × 6½, pp. 288. *Illustrations.* Price 12s. *Presented by the Publishers.*

A brightly written account of the journey already described in the *Journal* (vol. xvi. p. 306). The author gives a vivid, though a far from pleasing picture, of the present condition of Hayti, and in reply to the question, Can the Negro rule himself? gives it as his opinion that we may go beyond the non-proven of the Scottish courts, and say that "taken *en masse*, at any rate, he has shown no signs whatever which could fairly entitle him to the benefit of the doubt that has for so long hung about the question."

West Indies—Porto Rico. B. American G.S. 32 (1900): 328-330.**Gannett.**

The Census of Porto Rico. By Henry Gannett.

On the census taken by the U.S. War Department in the autumn of 1899.

West Indies—Trinidad and Tobago.**Bourne.**

Trinidad and Tobago. Report for 1899. Colonial Reports, Annual No. 303, 1900. Size 9½ × 6½, pp. 44. Price 2½d.

The year 1899 was a satisfactory one, as regards finance, trade, and agriculture. Sugar and cacao are still the principal products, but coffee, rubber, and timber are also receiving attention. The results of experiments at the St. Clair botanical station show that improved varieties of canes may yield a larger supply of sugar. The abnormally low rainfall of 1900 has prejudicially affected the sugar crop, but the effect has been partially counteracted by higher prices.

AUSTRALASIA AND PACIFIC ISLANDS.**Australia.****Rutledge.**

Souvenir of the Farewell Banquet to the Right Honourable the Earl of Hopetown, Governor-General of Australia. Edited by Chas. S. Rutledge. Size 15 × 10, pp. 42. *Illustrations.*

This contains an illustrated account of the various Australian colonies.

Australia—Meteorology.**Wragge.**

Meteorological Work in Australia. Interview with Mr. Clement L. Wragge, Government Meteorologist of Queensland. (From the *British Australasian*, October 25, 1900. Pp. 1506-1507.) Size 14 × 9. *Portrait.*

Fiji.**Allardyce.**

Fiji. Report for 1899. Colonial Reports, Annual No. 296, 1900. Size 10 × 6, pp. 26. Price 2d.

The exports of sugar during 1899 reached a figure of £340,602 as compared with £409,884 in 1898, but the latter was an exceptional year. Cane is being now cultivated by Indian coolies who have completed their term of indenture.

POLAR REGIONS.**Arctic—Greenland.***Globus* 78 (1900): 329-333.**Neger.**

Die schwedische Hülfsexpedition nach Ostgrönland zur Aufsuchung Andrées im Sommer 1899, unter A. G. Nathorst. Von F. W. Neger. *With Maps and Illustrations.*

Based on Dr. Nathorst's report in *Ymer*.

Arctic—Nansen's Expedition. *Petermanns M.* 46 (1900): 287-290. **Pompeckj.**

Wissenschaftliche Ergebnisse von Nansens Polarexpedition. Von J. F. Pompeckj.

Arctic—Swedish Expedition. *Ymer* 20 (1900): 325-329. **Pettersson and Östergren.**

Vattenprof tagna under "1900 års svenska zoologiska polarexpedition." Af O. Pettersson och Hj. Östergren.

On specimens of sea-water collected by the Hjort-Nansen expedition.

Franz Josef Land.

Nathorst.

The Norwegian North Polar Expedition 1893-1896. Scientific Results edited by Fridtjof Nansen. III. Fossil Plants from Franz Josef Land. By A. G. Nathorst. London: Longmans & Co. [1899]. Size 11½ × 9, pp. 26. *Plates.*

Greenland—East Coast. *Ymer* 20 (1900): 229-236.

Dusén.

Om Kartläggningen af Kejsar Frans Josefs fjord och Konung Oscars fjord. Af P. Dusén.

On the methods employed in the mapping of the fjords surveyed by Dr. Nathorst's Expedition (cf. *ante*, p. 60).

Spitsbergen—Degree Measurement. *Ymer* 20 (1900): 209-227. **Carlheim-Gyllensköld.**

Uppmätning af en meridiangradbåge på Spetsbergen genom en svensk-rysk expedition. Af V. Carlheim-Gyllensköld. *With Illustrations.*

A general account of the work of the Swedish and Russian parties, with extracts from Mr. Rubin's report on explorations in the vicinity of Mount Chydenius.

Spitsbergen—Degree Measurement. *Ymer* 20 (1900): 281-302.

De Greer.

Om gradmätningarnas framförande öfver södra och mellersta Spetsbergen. Af Gerard De Geer. *With Map.*

On the degree-measurement operations in Central and Southern Spitsbergen.

MATHEMATICAL GEOGRAPHY.

Geodesy.

Jahresbericht des Direktors des Königlichen Geodätischen Instituts für die Zeit von April 1899 bis April 1900. (Veröffentlichung des Königl. Preussischen Geodätischen Instituts. N.F. No. 4.) Potsdam, 1900. Size 9½ × 6½, pp. 34.

Latitude and Longitude. *B. American Bureau G.* 1 (1900): 144-151. **Gildemeister.**

Illustrative Lesson upon Latitude and Longitude for Fourth Grade or above. By Theda Gildemeister.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climates.

G.Z. 6 (1900): 593-611, 657-679.

Köppen.

Versuche einer Klassifikation der Klimate, vorzugsweise nach ihren Beziehungen zur Pflanzenwelt. Von Prof. Dr. W. Köppen. *With Maps.*

This will be specially noticed.

Continents and Oceans. *B. American Bureau G.* 1 (1900): 234-241.

Collie.

The Gross Topography of the Globe. By G. L. Collie.

Deserts.

Walther.

Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit. Von Johannes Walther. Herausgegeben mit Unterstützung der Königl. Akademie der Wissenschaften zu Berlin. Berlin: D. Reimer (Ernst Vohsen), 1900. Size 11 × 7½, pp. xiv. and 176. *Illustrations.* Price 12 m. *Presented by the Publisher.*

This will be specially noticed.

Meteorology—Temperature. *C. Rd.* 131 (1900): 920-922.

Teisserenc de Bort.

Variation saisonnière de la température à diverses hauteurs dans l'atmosphère libre. Note de M. Léon Teisserenc de Bort. *With Diagram.*

The results of an extended series of observations by means of balloons prove that a well-marked seasonal variation of temperature in the free atmosphere occurs to a height of at least 10,000 metres (32,800 feet).

Oceanography.

Ymer 20 (1900): 243-259.

Théel.

Om "bipolaritet" i hafsorganismernas utbredning. Af Hjalmar Théel.

On resemblances between the marine faunas of the north and south polar regions.

Vegetation and Rivers. *Meteorolog. Z.* 17 (1900): 491-504. **Wollny.**

Ueber den Einfluss der Pflanzendecken auf die Wasserführung der Flüsse. Von Professor Dr. E. Wollny.

A detailed investigation into the effects of a surface covering of vegetation in a country on the water-supply of its rivers. Cf. *ante*, p. 311.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. **Guy.**

Des moyens de provoquer l'adaptation des produits de l'industrie aux besoins du commerce extérieur et aux habitudes des populations. Par M. Camille Guy. Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude, 2^e Section—Question iii. Paris: Société de Géographie Commerciale. Size 10½ × 7, pp. 18.

Commercial Geography. *B. American Bureau G.* 1 (1900): 141-143. **Poe.**

A Lesson Plan for the study of a Natural Product. By Clara L. Poe.

BIOGRAPHY.

Cesnola. **Vedova.**

G. Dalla Vedova. Il Conte L. Palma di Cesnola e il Museo Metropolitano di Nuova York. (Estratto dalla *Rivista d'Italia*, fasc. 3^o, 1899.) Roma, 1899. Size 10 × 6½, pp. 16. *Presented by the Author.*

Based on a work by Dr. Roversi published in New York in 1898.

Kersten. *Globus* 78 (1900): 386-387. **Andree.**

Erinnerungen an Otto Kersten. Von R. Andree. *With Portrait.*

See note, *ante*, p. 199.

La Caze. *B.S.G. Rochefort* 22 (1900): 137-144. **Richemond.**

Vacher de La Caze, prince d'Amboule. Par M. de Richemond.

La Caze took a foremost part in the French undertakings in Madagascar in the seventeenth century.

Preuss. *Deutsche Kolonialzeitung* 17 (1900): 551-552, 565. ———

Unsere Kolonialpioniere. *With Portrait and Plan.*

Dr. Preuss, a German pioneer in the Cameroons, has lately carried out a successful journey in South America for the study of its economic botany. The plan shows the botanic garden at Victoria, Cameroons.

Richthofen. *G. Anzeiger (Petermanns M.)* (1900): 141-143. **Rohrbach**

Ferdinand von Richthofen. Von Dr. C. Rohrbach. *With Portrait.*

Roberval. *P. and T.R.S. Canada* 5 (1899), (Sec. i.): 71-78. **Dionne.**

Jean-François de La Rocque, Seigneur de Roberval. Par M. N. E. Dionne.

A short account of Roberval's life and voyages to the St. Lawrence.

GENERAL.

Almanac. ———

Annuaire pour l'an 1901, publié par le Bureau des Longitudes. Avec des Notices scientifiques. Paris: Gauthier-Villars. Size 6 × 4, pp. iv. 636, and [264].

French Colonies. **Mourey and Brunel.**

L'Année Coloniale, publiée sous la direction de MM. Ch. Mourey et Louis Brunel. Première Année (1899), avec la collaboration de MM. le Général Gallieni, Picqué et Teissier. Paris: C. Tallandier. Size 9 × 6, pp. viii. and 414. *Maps and Illustrations.* Price 4s. 6d.

This promises to be a most useful publication, bringing together into small compass a mass of information on the French Colonies otherwise scattered through a voluminous literature.

Geographical Congress. *B.S.G. de l'Est* 21 (1900): 7-50. **Auerbach**

Rapport sur les travaux du VII^e Congrès international de géographie tenu à Berlin du 28 Septembre au 4 Octobre 1899 et sur la visite du port de Hambourg (5-6 Octobre 1899). Par B. Auerbach.

Merchant Marine.

Special Consular Reports. Merchant Marine of Foreign Countries. Vol. xviii. Washington, 1900. Size 9 × 6, pp. xvi. and 182.

Pearl Oysters.

Collett.

Pearl Oysters and Pearl Fisheries. By Oliver Collett. (Reprinted from *Ceylon Observer*.) Meeting of the Ceylon Branch, Royal Asiatic Society, on October 27. Size 10 × 7½, pp. 12. *Presented by the Ceylon Branch, Royal Asiatic Society.*

Scientific Societies.

Evans.

The Origin, Development and Aims of our Scientific Societies. Address at the Opening Meeting of the 147th Session of the Society of Arts, November 21, 1900. By Sir John Evans, K.C.B., etc. London: Printed by W. Trousce, 1900. Size 8½ × 5½, pp. 32. *Presented by the Author.*

NEW MAPS.

By E. A. REEVES, *Map Ourator, R.G.S.*

EUROPE.**Austria-Hungary.**

Artaria.

Eisenbahn- u. Postkarte von Oesterreich-Ungarn. Vierte Neubearbeitung. Scale 1: 1,500,000 or 23·6 stat. miles to an inch. Verlag von Artaria & Co. Wien, 1901. *Price 2 Kronen. Presented by the Publishers.*

A new edition of Artaria & Co.'s useful railway and postal map of Austria-Hungary, with an alphabetical index to the stations. The various railway lines are distinguished by different colours and symbols, a full explanation of which is given.

England and Wales.

Ordnance Survey.

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from January 1 to 31, 1901.

1-inch—General Map:—

ENGLAND AND WALES (revision):—printed in colours, 192, 209 (combined); 226, 227, 244 (combined). *1s. each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Anglesey**, 2 N.W., S.W., S.E., 3 S.W., S.E., 5 S.W., S.E., 6 N.E. **Carnarvonshire**, 13 N.W., N.E., S.E., 19 N.W., 23 N.W., 30 N.W. **Cumberland**, 25 N.E., S.E., 26A S.W., 27 N.E., S.E., 28 S.E., 32 N.W., N.E., 34 S.E., 35 N.W., S.E., 36 N.W., N.E., S.E., 37 S.W., S.E., 38 N.W., N.E., S.W., 39 N.W., S.W., S.E., 40 N.W., N.E., S.W., 42 S.E., 44 S.E., 45 S.E., 46 N.W., 52 N.E., 59 N.W., 60 N.W., 66 S.W., 70 N.W., 71 N.W., 75 N.E., S.W., S.E., 76 N.W., 80 (N.W. and N.E.). **Denbighshire**, 33 S.E. **Derbyshire**, 36 S.W., 42 N.E. **Glamorganshire**, 14 N.W., 18 S.E., 19 S.W., 24 S.W., 28 N.W., S.W. **Northamptonshire**, 22 N.E., 23 N.E., S.E., 24 N.W., 29 N.W., N.E., 30 N.E., 31 N.E., S.W., S.E., 32 S.W., 36 N.W., S.E., 37 S.W., 38 N.E., 39 S.E., 42 S.E., 43 S.E., 46 N.W., N.E., 49 N.E., 50 S.W., 51 N.W., 52 N.W., S.W. **Nottinghamshire**, 2 N.E., 3 N.W., 21 S.E., 27 S.W., S.E., 32 N.E., 33 S.E., 35 N.W., N.E., 38 N.E., 39 N.W., 43 S.E., 44 N.W., 47 N.E., S.E., 50 N.E., 51 N.W. **Staffordshire**, 16 N.E., 17 S.E., 19 S.W., 20 N.E. **Wiltshire**, 8 S.E., 10 N.E., 15 N.W., S.W., S.E., 20 N.E., S.E., 22 N.E., S.W., 27 N.E., S.E., 28 S.W., 29 S.W., S.E., 35 S.E., 36 N.E., 37 S.W., 42 N.E., S.W., S.E., 43 S.E., 48 N.E. *1s. each.*

25-inch—Parish Maps:—

ENGLAND AND WALES (revision):—**Bedfordshire**, XXVIII. 7, 8, 11, 12; XXIX. 5, 6, 7, 8, 9, 10, 11, 12; XXXII. 3, 4, 7, 8, 9, 11, 14, 15; XXXIII. 13; XXXIV. 6, 7, 10. **Carnarvonshire**, XIX. 10; XXI. 5; XXIX. 10; XXXIV. 8, 12, 13; XXXV. 13; XL. 7; XLI. 6; XLIII. 7, 11, 15, 16; XLIV. 2, 3, 4, 5, 10, 16; XLVI. 6, 9, 10. **Cumberland**, III. 2, 3, 4, 8, 12, 15, 16; IV. 9, 10, 13, 14; VIII. 1, 2, 8, 5, 7, 9, 14; XII. 5, 8, 9, 10, 11, 13, 14; XIII. 5, 9; XV. 11; XVI. 7, 10, 12, 13, 14, 15, 16; XVII. 7, 8, 10, 11, 13, 14; XVIII. 3, 5, 11, 12; XXII. 3, 6, 11, 12; XXIII. 1, 2, 5, 6, 9, 10, 11, 12, 15, 16; XXIV. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. **Derbyshire**, XLV. 13; XLVI. 9, 14; XLVIII. 2, 3, 4, 6, 7, 8, 9, 11, 12; XLIX. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15; L. 7, 11, 12, 15, 16; LI. 2; LVI. 9, 11. **Glamorganshire**, VI. 15; XII. 1, 4; XIII. 5, 13; XIX. 16; XX. 1, 5, 9, 13; XXIX. 6, 9, 10, 14; XXXVIII. 1, 5, 9, 13; XLIII. 8. **Merionethshire**, I. 14, 15; III. 15, 16; IV. 10, 14; VI. 10; VII. 2, 4, 8, 12, 15; VIII. 1, 9; XI. 6, 11, 12, 13, 15; XII. 1, 3, 5, 9, 10, 13, 14, 15, 16; XIII. 3, 7, 8, 10, 11, 12, 13, 14; XIV. 1, 5,

6, 11; XVIII. 12, 16; XIX. 1, 2, 3, 4, 5, 9, 10, 14; XX. 1, 3, 5, 6, 7, 9, 10, 13, 14, 15; XXVI. 3, 6; XXVII. 1, 2, 3, 5. **Monmouthshire**, I. 6, 10, 15; III. 1, 2, 3, 4 (6 and 10), 7, 11; X. 15; XVI. 4; XVII. 5, 13; XXII. 1, 5, 9, 13; XXVII. 6, 9, 10, 14; XXXIII. 1, 5, 6, 9, 10, 13, 14; XXXVII. 8; XXXVIII. 1. **Northamptonshire**, I. 8, 11, 12, 15, 16; II. 4, 6, 7, 8, 10, 13; III. 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16; IV. 1, 5, 6, 10, 14; V. 15, 16; VI. 3, 7, 10, 11, 16; VII. 1, 3, 7, 8, 12, 16; VIII. 1, 2, 4, 5, 6, 8, 9, 10, 13; IX. 2, 5; X. 11, 12; XI. 7, 8; XII. 7, 9, 10, 11; XIII. 2, 5, 16; XIV. 1; XV. 14; XVII. 7; XVIII. 4; XIX. 5; XXIV. 16; XXV. 3; XXVI. 6; XXXIII. 5; XXXVIII. 13, 14, 15; XXXIX. 3; XLIV. 8, 12; XLV. 3. **Nottinghamshire**, XXXVII. 2, 7, 14; XXXVIII. 9; XLI. 2, 12; XLII. 3, 4, 7, 8, 9, 11, 13, 14, 15, 16; XLV. 11, 12, 15; XLIX. 2, 3, 4, 7, 8, 11, 12, 15, 16; LII. 4. **Wiltshire**, XXV. 13, 14, 15; XXXII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16; XXXIII. 1, 13; XXXVIII. 2, 3, 9, 10; XXXIX. 1, 2, 3, 5, 6, 7, 11, 12, 13, 14, 15, 16; XL. 6, 9, 10, 11; XLV. 2, 6; XLVI. 2, 5; XLVII. 13, 14, 15; XLVIII. 13, 14; LI. 7, 12; LII. 3, 8, 9; LIII. 2, 9, 11, 12, 13; LIV. 1, 2; LV. 2, 9, 11; LX. 6, 11, 12, 14, 15, 16. *3s. each.*

Guernsey

6-inch:—Complete in 11 quarter sheets. *1s. each.*

(*E. Stanford, London Agent.*)

ASIA.**China.****Waeber.**

Map of North-Eastern China. Scale 1 : 1,355,000 or 18·5 stat. miles to an inch. Ch. Waeber, 1900. Second edition. Chief depôt: L. Friederichsen & Co., Hamburg. 4 sheets.

Apart from the addition of railways and the boundaries of the British, German, and Russian territories of Wei-hai-wei, Kiao Chou, and Port Arthur, little alteration has been made to this map, which was first published in 1893.

Tonking.**Bureau Topographique des Troupes de l'Indo-Chine.**

Carte du Tonkin. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Sheets: Cao Bang, Hanoi, Laokay, Luang Prabang. Bureau Topographique des Troupes de l'Indo-Chine, Hanoi, 1899. *Price \$0.60 each.*

This map of Tonking, in four sheets, has been prepared at the Bureau Topographique des Troupes de l'Indo-Chine at Hanoi, under the superintendence of Commandant Lebreton. It is roughly lithographed in colours, but contains a good deal of useful information, especially with regard to means of communication.

AFRICA.**Africa.****Johnston.**

Map of Africa. Scale 1 : 11,800,800 or 186·25 stat. miles to an inch. By G. H. Johnston, F.R.G.S. W. & A. K. Johnston, Edinburgh and London, 1901. *Price 1s. (coloured). Presented by the Publishers.*

Egypt.**Petermanns Geographische Mitteilungen.**

Originalkarte des Nilthals von Farschüt bis Kom-Ombo, Ober-Ägypten. Nach den Originalkarten des ägyptischen Ministeriums der öffentlichen Arbeiten in 1 : 100,000 or 1·6 stat. mile to an inch, und nach Prof. Dr. G. Schweinfurth's Aufnahmen im Jahre 1882, reduziert auf den Masstab 1 : 400,000 or 6·3 stat. miles to an inch. *Petermanns Geographische Mitteilungen*, Jahrgang 1901, Tafel 1. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

German East Africa.**Böhler.**

Ost-Usambara, 1897-99. Trigonometrisch und topographisch aufgenommen, berechnet und gezeichnet durch H. Böhler. Scale 1 : 50,000 or 0·8 stat. mile to an inch. D. Reimer (Ernst Vohsen), Berlin, 1901.

This is a map of a part of the Usambara district of German East Africa on the comparatively large scale of 1 : 50,000, based principally upon the trigonometrical and tacheometrical surveys of Messrs. Lammerl and Röpke. Contour-lines at intervals of 50 and 100 metres are laid down from 200 to 1200 metres in altitude, in addition to which the relief is indicated by brown shading. Coffee plantations are coloured red, and by means of other colours and symbols a considerable amount of additional information is given with regard to the agricultural and physical conditions of the district, European stations, and native villages. The map includes an area of about 220 square stat. miles.

South Africa.**Wood and Ortlepp.**

Map of Cape Colony and part of Bechuanaland. ("Briton or Boer.") Scale 1: 1,267,200 or 20 stat. miles to an inch. Wood and Ortlepp, Cape Town and Johannesburg, 1900. 3 sheets. *Presented by Messrs. G. Philip & Son.*

The two previous sections of this map, which have already appeared, include the Orange River Colony, the Transvaal, Southern Rhodesia, and Eastern Bechuanaland; but now Messrs. Wood and Ortlepp have published a third section in three sheets, which contains the Cape Colony, the remaining portion of Bechuanaland, and a part of German South-West Africa. It is printed in colours, the hills being shown by a system of brown horizontal line work, the water blue, and names in black.

AMERICA.**Argentine Republic.****Comision Argentina de Limites con Bolivia.**

Plano Topografico de la Region Norte Argentina Limitrofe con Bolivia. Scale 1: 575,000 or 9.7 stat. miles to an inch. Comision Argentina de Limites con Bolivia. *Presented by the Comision Argentina de Limites con Bolivia.*

The area included in this map lies between S. lat. $21^{\circ} 27'$ and $23^{\circ} 27'$, and from the upper waters of the Rio Pilcomayo to $67^{\circ} 16'$ W. long. It is a photographic reduction of a map based on the surveys made by the Argentine Commission in connection with the boundary question between the Argentine Republic and Bolivia.

Chile.**Martin.**

Karte von Llanquihue und Chiloe. Scale 1: 1,200,000 or 18.9 stat. miles to an inch. Von C. Martin. *Petermanns Geographische Mitteilungen*. Jahrgang 1901, 'Tafel 2. Gotha: Justus Perthes, 1901. *Presented by the Publisher.*

PACIFIC OCEAN.**Pacific Ocean.****Bartholomew.**

Bartholomew's Chart of Oceania and the Pacific Ocean, on Mercator's Projection. J. Bartholomew & Co., Edinburgh, 1901. Price 3s. *Presented by the Publishers.*

The limits of this chart in latitude and longitude are approximately 52° N. to 47° S. and 100° E. to 70° W. It thus includes parts of Eastern China and Russia, the whole of Japan, the East Indian Archipelago, Australia, New Zealand, and considerable portions of North and South America. Ocean currents, steamer lines, and telegraphs are shown, and some soundings are laid down. Political boundaries are coloured, and in the case of the Pacific islands, it is clearly stated to which European nation they belong.

GENERAL.**World.****Pelet.**

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies par Paul Pelet. Paris: Armand Colin & Cie. Livraison 4. Price 3 francs.

This fourth part of Pelet's atlas of the French colonies, which is being issued by authority of the Minister of War, contains maps Nos. 18 and 19, Madagascar, Central Part, and No. 23, French possessions in India, and French Guiana. There is also given, in the same folio, eight pages of geographical and statistical information concerning French West Africa, followed by a useful bibliography of those regions. The maps, like the others belonging to this atlas, are clearly drawn and printed in colours.

CHARTS.**Admiralty Charts.****Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, November and December, 1900. *Presented by the Hydrographic Department, Admiralty.*

No.	Inches.		
442 m	= 0.5	England, south coast:—Lizard head to Start point.	2s.
1403 m	= { 3.0 6.8	Scotland, west coast:—Loch Ryan.	
		Stranraer harbour.	1s. 6d.
3146 m	= 6.7	Scotland, west coast:—Loch Ewe.	2s. 6d.
3150 m	= 1.4	Norway, south-east coast:—Lillesand to Narestö.	2s. 6d.
3151 m	= 1.4	Norway, south-east coast:—Narestö to Portor.	2s. 6d.
3149 m	= 5.0	Balearic islands:—Alcudia bay.	1s. 6d.
3156 m	= 0.24	Brazil:—Cape Tromba Grande to Itacolomis reef.	2s. 6d.

- 3157 m = 0.24 Brazil:—Itacolomis reef to Rio Doce. 2s. 6d.
 2870 m = 0.5 British Columbia:—Toba, Bute, and Loughborough inlets. 2s. 6d.
 3138 m = Var. Anchorages in South-east Alaska:—Klawak inlet and approach, Cape Chacon, Tamgas harbour, Mary island anchorage and Custom House cove. 2s. 6d.
 1147 d = 3.8 Africa, west coast:—Cape Verde to Cape St. Ann. 2s. 6d.
 3147 m = 3.95 Africa, west coast:—Entrance to Sierra Leone river. 2s. 6d.
 3139 d = 3.7 Africa, west coast:—Cape St. Ann to Cape Three Points. 3s.
 3145 m = 3.9 Andaman islands:—Port Anson. 2s. 6d.
 3148 m = 0.72 Celebes, east coast:—Salabangka strait. 1s. 6d.
 3126 m = 0.98 Anchorages in the Philippine islands:—Kasiguran bay. 1s.
 389 m = 10.0 China, east coast:—Shanghai harbour. 2s. 6d.
 2357 m = 6.0 China, east coast:—Ching Wang Tao road. 1s. 6d.
 3152 m = 2.9 Australia, west coast:—Ashburton road. 2s.
 2204 m = 2.4 Anchorages on the north coast of New Guinea:—Angriffs haven. 1s.
 3137 m = 2.8 Society islands:—Port Phaëton and approaches. 1s. 6d.
 2082 Africa, south coast, Table bay to Cape Agulhas:—Plan added, Hout bay. 2s. 6d.
 671 Plans on the east coast of Africa:—Plan added, Bander Alula anchorage. New plans:—Obiat anchorage, Mogdishu, Merka anchorage, Brawa anchorage, Athelet anchorages.
 3003 Japan:—New plan, Sakata harbour.
 (J. D. Potter, Agent.)

Charts Cancelled.

No.	Cancelled by	No.
1403 Loch Ryan.	{ New plan. Loch Ryan	1403
904 Abrolhis rocks.	{ New chart. Itacolomis reef to Rio Doce	3157
2110 Plan of Mary island anchorage on this sheet.	{ New plan. Mary island anchorage and Custom House cove	3138
635 Hout bay.	{ New plan. Hout bay	2082
1256 Plan of Shallow bay on this chart.	{ New Plan. Ching Wang Tao road	2357
389 Shanghai harbour.	{ New plan. Shanghai harbour	389
1055 Plan of Ashburton road on this chart.	{ New plan. Ashburton road	3152

Charts that have received Important Corrections.

No. 2598, The World:—Magnetic variation. 1170B, England, west coast:—Great Ormes head to Liverpool. 1951, England, west coast:—Liverpool bay. 2114, Baltic entrance:—The Kattegat. 2300, Gulf of Bothnia, sheet 5. 185, Germany:—Port Swinemunde. 696, Baltic:—Kiel harbour. 2643, France, west coast:—Raz de Sein to Goulven. 2690, France, west coast:—Brest roadstead. 798, France, west coast:—Donarnenez bay and approach. 2713, Adriatic sea:—Curzola to Cattaro. 1590, Adriatic:—Durazzo bay. 1463, Adriatic sea:—Ports and anchorages in Dalmatia and Albania. 2070, Ægean sea:—Saloniki bay. 1941, Gulf of St. Lawrence:—Cocagne harbour. 2600, West Indies:—San Domingo to Dominica. 1801, South America, east coast:—Trinidad to Surinam. 1142, Brazil:—Port of Cape Frio. 1673, Brazil:—Port Angra dos Reis and Jacuacanga bay. 2139, Central America:—Port Nuevo. 2816, Central America:—Parid and Palenque anchorages. 2531, United States, west coast:—Cape Mendocino to Vancouver island. 611, Vancouver island:—Griffin bay. 602, Vancouver island:—Roche harbour. 2689, British Columbia:—Haro and Rosario straits. 2840, British Columbia:—Haro strait and Middle channel. 580, British Columbia:—Strait of Georgia, sheet 2. 1365, Africa, west coast:—Baffu bay to Grand Berebi. 2768A, Africa, west coast:—Badagri to Cape Formosa. 2768B, Africa, west coast:—Cape Coast Castle to Badagri. 636, Africa, south coast:—Cape of Good Hope and False bay. 1849, Africa, south coast:—Simons bay. 1577, Africa, east coast:—Lower Zambezi river. 143, Red sea:—Jebel Teir to Perim island. 2837B, Persian gulf, northern portion. 1235, Persian gulf:—Mouth of the Euphrates. 941B, Eastern Archipelago, western portion. 2637,

Strait of Makassar, south part. 2660B, China sea, southern portion. 1961, China sea:—Pescadores islands. 2347, Japan:—Nipon, Kiusiu, and Shikoku. 1203, Japan:—Uraga harbour. 1700, Australia, west coast:—Fremantle harbour and Gage roads. 134, South Pacific:—Anchorage in New Hebrides.
(*J. D. Potter, Agent.*)

United States Charts.**U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for January, 1901, and of the North Pacific Ocean for February, 1901. U.S. Hydrographic Office, Washington, D.C.
Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.**China.****Jack.**

Thirty Photographs taken in Sechuen by Dr. R. L. Jack, 1900. *Presented by Dr. R. L. Jack.*

These photographs form a welcome addition to those presented by Dr. R. L. Jack some months ago, and which have already been noticed in the *Journal*. As will be seen from the following titles, some of the subjects are especially interesting.

(1) Undershot waterwheel (of bamboo) with bamboo buckets on rim for irrigating paddy-fields, Nan Ching Yih; (2) Iron urn at Tsing Yang Kung temple, Chengtu; (3) Roofed wooden bridge near Lung Chow; (4) Divisional dykes of the Kwang Ko irrigation works; (5) Bamboo rope suspension bridge; (6) Exterior of smelting works, Tung Ling Tse; (7) Chinese magistrate climbing a hill; (8) Camp of party at Tung Ling Tse, with Chinese escort; (9) Garden of the "Propitious Star Hotel," Pen Hsien; (10) Three-arched stone bridge, Han Ju Chow; (11) Roadway of bridge, Han Ju Chow; (12) Widows' memorial arch across the road, Han Ju Chow; (13) Ploughing in a rice-field with a water-buffalo; men raising water with Chinese foot-pump; (14) Chief idols of the temple of Kwang Ti; (15) Behind the main altar of the temple of Kwang Ti; (16) Garden of the Cantonese guildhall, An Hsien, showing ornamental pond; (17) Vertical bed of quartzite, Hwong Hsang Kow; (18) Bamboo bridge, 80 yards span, Shih Chuen; (19) Anchoring and straining gear of the Shih Chuen suspension bridge; (20) Rafting timber down the Fou Kiang from Lung An; (21) Entrance to the Cantonese guildhall, An Hsien; (22) A gorge of the Fou Kiang, below Ping Yi Pu; (23) Wayside inn, at 9000 feet elevation, between Lung An and Sungpan; (24) Snow-clad mountain of Hsueh Shan, which is crossed by the Sungpan-Lung An road; (25, 26) Interior of a room in the Mining Bureau, Chengtu; (27) Courtyard in the Mining Bureau, Chengtu; (28) General view at Tsing Yang Kung annual fair; (29) Chinese officials; (30) Dr. R. L. Jack, R. Lockhart Jack, J. Morris, and Chinese officials.

South Africa.**Melville.**

Twenty-two Photographs of Scenes of Battles at Modder River, Magersfontein, Paardeberg, Kimberley, etc. By E. H. V. Melville, Esq., 1900. *Presented by E. H. V. Melville, Esq.*

Apart from the special interest attached to these photographs, inasmuch as they represent the scenes of battles, and the graves of many of our brave soldiers who have fallen in South Africa, they serve well to illustrate the character of the country and the natural difficulties our troops have to contend with. They are remarkably well taken, and are accompanied by a sketch-map of the British graves at Paardeberg. The following is a list of their titles:—

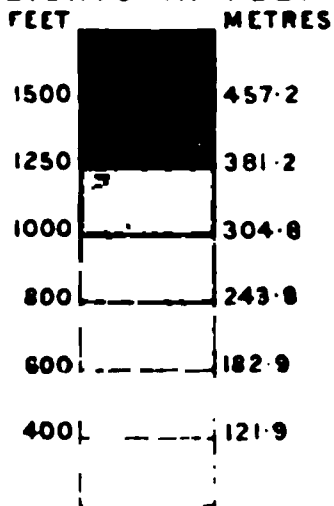
Modder river.—(1) Modder river; (2) Modder river bridge; (3, 4) British graves. *Magersfontein.*—(5) Long Tom position, looking towards Modder river; (6) Tree where General Wauchope was killed; (7, 8) Boer trenches; (9) Graves of officers and men; (10) Trench. *Paardeberg.*—(11, 12, 13) British graves; (14) Camp, O.R.C. police; (15) Graves of six men of the Royal Canadian regiment; (16) Mrs. Cronje's shelter; (17) Cronje's camp. *Kimberley.*—(18) Search-light on Premier mine debris heap; (19) Conning tower; (20) Kimberley from Carter's ridge; (21) Premier mine, Wesselton; (22) Scholtz Nek.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

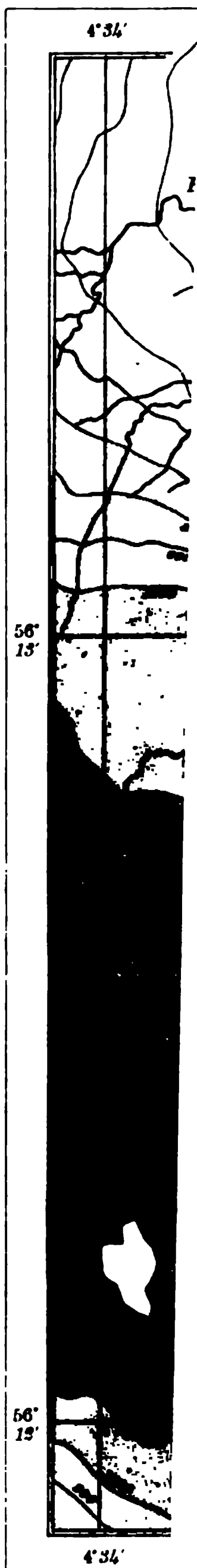
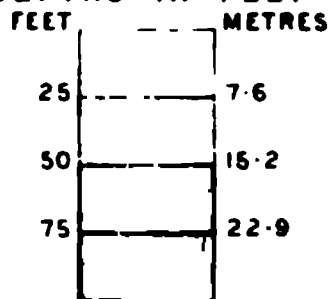
PLATE I

E

HEIGHTS IN FEET



DEPTHS IN FEET



The Edinburgh Geographer

The Geographical Journal.

No. 4.

APRIL, 1901.

VOL. XVII.

SOUTH AMERICA: AN OUTLINE OF ITS PHYSICAL GEOGRAPHY.*

By COLONEL GEORGE EARL CHURCH, Member of the Council of the
Royal Geographical Society.

THE physical features of South America have had such a marked influence upon its commercial development that a general knowledge of them is of primary importance to any student of its history.

The contrast between North and South America is remarkable: Nature was in her kindest mood when she created the former—gave it vast and fertile plains; low and readily transitable mountain ranges; extensive systems of navigable lakes and rivers, the latter not too difficult to bridge; great forests of the most useful timber; immense mineral wealth, including an abundance of coal and iron; a coast-line offering numerous excellent harbours easily accessible from the interior; and a temperate, inviting climate over almost its whole area. It is a land where man seems to live with nature on friendly terms, and where the wave of humanity, as it rolls westward, encounters no obstacle which it cannot readily overcome. How opposite to all this is South America! It lies mostly within the tropics; its fertile plains, except those of the Argentine Republic, are difficult of access; it is a formidable task to scale and cross its mountain ranges; its rivers, with rare exceptions, are of violent flow and full of obstacles to navigation, and its largest ones not within the limit of practical engineering to bridge; its

* Read in abstract at the Royal Geographical Society, February 25, 1901. Preliminary chapter of a work to be entitled, 'South America: An Outline of its Physical Geography and Commercial History.' *Copyright of the Author.* Maps, p. 460. The map of South America is based on the corresponding map in the 'Atlas Universel de Géographie,' by MM. Vivien de St. Martin and F. Schrader, by kind permission of the publishers, MM. Hachette et Cie.

vast forests are hard to work and frequently impenetrable; its mineral wealth, immense in nobler metals, includes but little coal and iron; its coast has but few good harbours, and these are almost all mountain-locked; its climate, although in many parts delightful, is uninviting over extensive regions; the forces of nature are so vigorous that man can seldom count upon the unqualified control of them, and, in general, they confer generous reward only upon well-applied and persistent energy.

THE ANDES.*—If from the most western point of Peru, near Payta, a straight line be drawn as far south as the western entrance to the Straits of Magellan, it will be found that the Pacific coast, at lat. $18^{\circ} 30'$,† near Arica, is 500 miles distant at a right angle to that line. The Andes here are also 500 miles in breadth. It seems as if some mighty force had pushed them eastward when they were in a plastic state. They are massed into that complex system of mountains, ridges, parallel, transverse, and interlaced, isolated peaks and volcanic cones, which lie between lat. $14^{\circ} 30'$ and $22^{\circ} 30'$. They form the *massif* of the Andes, the general level of which is much higher than any other equal area of the New World, its plateaux ranging from 12,000 to 14,000 feet elevation. The Bolivian portion alone has thirty-two peaks above 17,000 feet in altitude, including the grand domes of Chorolque (18,450 feet), Guadalupe (18,870), Todos los Santos (19,382), Lipez (19,650), Sajama (21,000), Illampu (the “resplandor” in the Aymara tongue) (21,275), and Illimani (21,190).

THE MASSIF.—I roughly estimate that this most bulky section of the Andes—the *massif*, 500 miles wide from east to west—contains about 487,000 cubic miles of rocky material above sea-level; and, were it spread out to an average height of 378 feet, would make an area equal to that of the whole of South America, say 6,798,000 square miles. Thus we may partially comprehend what physical changes the denudation and erosion of such a range of mountains is capable of producing. Stretching its arms to the north and south, this Andean *massif* spans with them a sixth part of the circumference of our globe, from the Caribbean sea to Cape Horn; and, for the entire distance, there is not a break, from side to side, save where several streams, which rise in the Patagonian plains of the Argentine Republic, find their way through the Cordillera to the Pacific ocean.

The *massif* is a titanic barrier, formidable to scale, as I have often found. On its broad and bleak plateaux, cradled between the Cordillera and the inland Andes, the Incas, imitating nature, also focused their

* See map of South America, p. 460.

† All latitudes herein mentioned are south, and all elevations are in English feet and dated from sea-level, unless otherwise stated. I shall use the word *Cordillera* to represent the single chain or cord, the long main ridge or *Cordillera of the Andes*, the continuous backbone of the continent, and shall not apply the term *Cordillera* to the inland range of the Andes or to any of its numerous ramifications. All “miles” are English statute miles.

empire, and stretched their powerful arms along the mountains over more than 40° of latitude.

From the *massif*, the Andes lose in bulk towards the north and towards the south, although at times some monarch dome, like Chimborazo or Aconcagua, climbs, from a vast base, to indisputable pre-eminence. The height of the passes between $7^{\circ} 45'$ and 37° lat. shows how nature has forbidden their transit, except under almost insurmountable difficulties, and how only a small fraction of the trade of South America can take place from the Pacific side. This is confirmed by the continental drainage, 89 per cent. of which finds its way to the Atlantic ocean, and only 6 to the Pacific; 5 per cent. being absorbed by the thirsty inter-Andean section and the western part of the Argentine Republic.

PASSES.—The lowest pass of the coast Cordillera between lat. 23° and 27° is 13,911 feet, and 12,000 feet between lat. 27° and 32° . Then in lat. $32^{\circ} 33'$ is the Uspallata pass, commonly called "La Cumbre," above which towers the superb cone of Aconcagua. This is the historic pass of Spanish colonial days, across which commerce was extensively carried on between the Captain-Generalcy of Chile and the Plata provinces. Its elevation is 11,512 feet. The next low pass is the Planchon, near 36° lat., about 10,000 feet elevation; thence the passes rapidly become lower, until, at $30'$ lat., we find the Nahuel Huapi gap only 4920 feet above the sea.

Between lat. 23° and 35° , they are blocked by snow from May to August, or swept by violent storms, especially throughout the forbidding, barren, dry, saline, desert region of south-west Bolivia, north-east Chile, and north-west Argentine Republic, called the *Puna*, which has an elevation of from 11,500 to 13,500 feet. This *puna* region, which in Quichua means a lofty district, is much broken and diversified, and shows many volcanic peaks. Diagonal ridges occasionally connect the two main, snow-crested ranges, between which rise hundreds of lofty mountains, having their drainage into saline plains and depressions which lose their waters with extreme rapidity, solely by evaporation.

From its inland side, the Andean *massif* sends to the southward a vast, broad, netted belt of ridges which forms the western boundary of the Argentine Chaco. They find their most prominent grouping in and round the Sierra de Aconquija, which raises its culminating point to a height estimated at 17,720 feet. The belt, however, shows many other peaks of marked prominence, but it gradually narrows and grows lower until completely broken through by the enormous Salina Grande. It afterwards reappears in the Sierra de Cordoba, the most southern spur of which is about lat. 33° .

INLAND CHAIN.—The true inland range of the Andes, south of 18° , commences near Santa Cruz de la Sierra, in Bolivia, takes a south-south west course, is twice broken through by the headwaters of the Pilcomayo

river, again rises to an imposing height near Tarija, which lies on its south-eastern slope; then, in a much broken, deeply carved, ragged, and confused chain of sierras, sometimes in line and then again echeloned, continues as far as the Sierra de la Huerta, in the Argentine province of San Juan; but, after breaking down there, it rises again in the hills of Pencoso, in the province of San Luis, which may be said to be the last trace of the inland range. Many of its peaks rise to a great altitude, and the splendid dome of Famatina, crowning one of its grand counterforts in the Argentine province of La Rioja, reaches 20,680 feet. Broadly, a line drawn from Santa Cruz de la Sierra to the peak of Aconcagua defines the eastern boundary of the great tableland of the Andes, on the western side of which lies the main Cordillera.

The whole belt of country, 250 to 300 miles wide, which lies between the Pacific ocean and the Gran Chaco, is a barren, almost waterless wilderness, "An extraordinary parallelism exists between the numerous lines of sierras, mostly running north and south, which fill the space. Between them, are deep, scooped-out depressions, sometimes containing salt lagoons. On rare occasions of violent storms, these receive torrential streams from channels which ordinarily carry but little water, and many of which are dry for most of the year. The entire district appears to be a southern prolongation of the Titicaca basin, and possibly may have been so before the Andes reached the present elevation. As it extends southward, it grows lower and less broken, and the *salinas* occupy a larger area, until, to the west and north-west of the Sierra de Cordoba, they are of enormous extent." *

In all the primary and secondary southern offshoots from the Andean *massif* are found volcanic cones, isolated or in groups. The principal summits are numerous; more than thirty are from 17,000 to 20,000 feet high, and Aconcagua lifts its crown to an elevation of 23,080 feet.

South of about 33°, the orographic character of South America undergoes a marked change; there is no longer a broad, lofty tableland, rimmed by gigantic mountains on the east and west. On the contrary, the Andean system now seems massed into a single majestic range from Aconcagua to lat. 41° 30'; thence, dipping its feet in the Pacific ocean along the whole western side of Patagonia, it crosses the Straits of Magellan and borders the entire southern coast of Tierra del Fuego, to defend the continent from antarctic storms. From Aconcagua to the Strait of Le Maire, a wide, magnificent belt of snowy domes gives the Andes continuous dignity and definition. There is a bifurcation of the range at about 38° of latitude, which extends south-south-east and loses itself in the Argentine territory of Neuquen.

TARAPACÁ.—Lying between the rivers Camarones and Loa, which

* See my Presidential Address to the Geographical Section of the British Association, 1898, on "Argentine Geography and the Ancient Pampean Sea."

flow into the Pacific ocean, is the desert of Tarapacá, which, with its southern prolongation, the Antofagasta and Atacama desert, forms a part of the arid, sandy, rainless, wilderness belt of South America, extending from about $3^{\circ} 30'$ to 33° lat. It has a width of from 30 to 100 miles as far south as 23° , and then for 10° widens to 200 and 300 miles. The Tarapacá portion contains the most accessible and workable nitrate of soda deposits known. These desert lands are sometimes swept by violent winds, which pile the drifting sands into immense dunes.

A desolate coast range of mountains, about 30 miles wide, rising to an elevation of from 3000 to 6000 feet, runs the entire length of Tarapacá, and separates its bare plateau, over 30 miles across, from a confused outlying foot range of highlands belonging to the Cordillera of the Andes. This plateau, which is from 3000 to 3500 feet above the sea, is covered with sand, salt, nitrate of soda, and salts of borax.

ANTOFAGASTA AND ATACAMA also abound in nitrate of soda, and have rich ores of silver and copper; but, in common with Tarapacá, lack potable water. They form an immense inclined plain, sloping from the Cordillera to the coast sierras, and divided into large basins by intersecting mountain spurs running, at times, diagonally north-west from the Cordillera, and again by other spurs projecting south-east from the coast mountains. The deposits of nitrate of soda are found between lat. 24° and $26^{\circ} 30'$, and occasionally at an altitude of 13,000 feet. The low coast range rises boldly from the ocean, and the plateau behind it is reached through gorges extremely laborious and difficult to penetrate.

As if to accentuate to a still greater degree the contrast between the geographical features of that part of South America lying north of Aconcagua and the portion south of it, nature has not only made lat. 33° the southern limit of the great inland Andes, but also the southern boundary of the desert belt of the Pacific coast; for this is here stopped by the transverse mountain barrier of Chacabuco, which separates it from the delightful, healthy, fertile, and well-watered valley in Chile, which, 50 miles wide, lies between the Cordillera and a low mountain range which immediately borders the Pacific coast, and extends as far as lat. $41^{\circ} 30'$. It is one of the fairest, most inviting valleys I have ever looked upon; but, at the degree of latitude last mentioned, it disappears under the sea, and the now broken-down coast sierra is cut into fragments and a multitude of thickly wooded islands as far as the Straits of Magellan. Through the many channels, inlets, and gulfs the ocean finds its way, and breaks ceaselessly against the precipitous and glacier-dotted Cordillera of the Andes, as if it had also determined to tear that into fragments.

In lat. $18^{\circ} 30'$, the eastern foothills of the *massif* are separated by only a narrow gap of about 120 miles from the low Chiquitos sierras belonging to the Brazilian orographic system, some of which, overlooking the Argentine Chaco, and having a southern drainage into the

river Paraguay, form a part of the *divortium aquarum* between the Amazon and Plata valleys.

There is a great bend of the inland Andes, almost at a right angle, at Santa Cruz de la Sierra. From this point, a vast, uninterrupted chain extends north-west as far as northern Perú, a distance of 1500 miles. Its first section, which bounds the Bolivian province of Cochabamba on the north, rapidly increases in height towards the west until it culminates in the Tunari crest, which climbs to above 16,000 feet. This section overlooks the Mojos plains of Bolivia, and, on its Amazon slope, is precipitous and densely forested.

To the west of Tunari, in lat. $17^{\circ} 30'$, and about halfway between it and the Bolivian city of Oruro, commences a broken central range of mountains, with isolated domes and volcanic cones, which extends almost directly south until it again unites with the eastern rim of the Andean tableland at $24^{\circ} 30'$ lat. At times it has neighbouring parallel lines of isolated sierras and peaks for long distances. It separates the upland district of the *massif* into two sections—the western, which is arid and of too great an altitude for the cultivation of cereals; and the eastern, which gradually drops in height until it abuts boldly upon the Bolivian and Argentine Chaco. This eastern section is much eroded by the numerous headwaters of rivers which are tributary to the Mamoré branch of the Madeira, and by others which flow to the Paraguay.

The central range is generally accepted as the main inland Andes; but I am disposed to concede that rank to the more eastern mountains I have described, although by no means so lofty. The central, according to my observation, appears to belong to the vast tableland which here so remarkably broadens to its maximum width. It presents many peaks and domes from 14,000 to 19,000 feet high; and the snow-crowned Lipez rises to an altitude of 19,650 feet. From this peak, the Lipez barrier, cut by lat. $22^{\circ} 30'$ and composed of a confused belt of *cerros* and knotted ridges, crosses the tableland to the west and north-west, and joins the Pacific coast Cordillera, forming the southern boundary of a lacustrine basin which has an area of 106,000 square miles, and which was once the cradle of an enormous lake, the shrunken remains of which are now known as lakes Titicaca and Pampa Aullagas or Poopo. Lake Titicaca is 12,505 feet in altitude, and has an area of about 3300 square miles. Its surplus waters flow south into the small, shallow Poopo by the narrow Desaguadero channel. Poopo has an elevation of 12,136 feet, according to Ruck.

North-west of Tunari, and as far as Chololo (17,625 feet elevation), at the knot of Apolobamba, a direct distance of 270 miles, the inland Andes overlook the Amazon valley with a huge range of crests and peaks, Illimani and Illampu, the twin giants, overtopping them all. I know of no more beautiful sight than to look eastward, across Lake

Titicaca, at that matchless battalion of snow-crested cones, as the morning sun bursts in among them and rolls vast waves of gold and purple mists up their slopes, until their ice-jewelled crowns break forth in resplendent glory.

The much-eroded and forested eastern slope of this range descends abruptly to the plains of the Beni, once a part of the bed of the ancient Mojos lake.

THE PERUVIAN ANDES.—From the lofty peak of Chololo, the great transverse barrier of Vilcanota roughly curves to the north-west and then south-west, and completely crosses the Andean tableland to unite with the coast Cordillera. It divides the lacustrine basin of Titicaca from the headwaters of the Ucayali, which flows north to join the upper Amazon. This barrier, cut by lat. $14^{\circ} 30'$, has been paramount in determining the topographical features of western South America; for, did it not exist, the Titicaca basin would drain to the northward. As it is, this arid area belongs to the southern orographic system of the Andes. At no remote geological period, it was at a much lower elevation, was fertilized by moisture from the ancient Mojos lake and Pampean sea, and sent its abundant drainage into the south-western river system of the present Argentine Republic. The Vilcanota barrier is the northern and the Lipez barrier the southern limit which I have ventured to assign for the Andean *massif*.

From Chololo north-west, the Andes, continuing for a long distance as the Carabaya range, are prolonged to the knot of Cerro de Pasco, and thence, along the east side of the Marañon, to its great bend, where they broaden into a little-known, complex mass of sierras 100 miles wide, round the western and north-western base of which the river has cut a profound cañon. A little north of the Cerro de Pasco, the short distance dividing the inland Andes from the Cordillera is occupied by an irregular group of mountains, which crosses the tableland transversely and unites the two great ranges. In this group is found the most western section of the Amazon, here called the Marañon.

The inland Andes have been terribly eroded and broken down for a long distance by the Paucartambo, Urubamba, and Apurimac affluents of the Ucayali, assisted by their countless torrential tributaries; and at least 15,000 square miles of country north of Cuzco is a wild tangle of ridges and jungle-matted gorges, impracticable to traverse.

The almost unknown region lying between the Ucayali and the Juruá and Purús affluents of the Amazon has been too little, or too roughly, penetrated to ascertain its orographic character; but probably a low range of highlands exists there, which parallels the inland Andes from $6^{\circ} 30'$ to lat. 14° . This range, and the country lying immediately east of it, would afford a fine field for exploration, and is probably rich in gold and forest products, but it has many savage tribes.

The Cordillera, between $7^{\circ} 45'$ and 23° lat., presents a bold escarpment

to the Pacific ocean. It has twenty-eight transitable passes, very few of which are of practical use. They average about 15,350 feet elevation, and the lowest one, about lat. 23° , is 12,983 feet. North of $7^{\circ} 45'$ lat. the passes decrease in height, and the town of Humani, near this parallel, is seated on the crest of the Andes at an altitude of only 7170 feet.

North of 15° lat., the inter-Andean section, as far as the vicinity of Ecuador, is scarcely a tableland. It is a lofty district covered by Andean spurs, isolated mountains, knots, parallel and diagonal ridges, among all of which are many streams that find their way to the Marañon, the Huallaga, and the Ucayali. It is a vast belt of mountainous country, through any portion of which communications are extremely difficult, and which has no overland road whatever connecting it with the Amazon valley east of the Ucayali river, and not even a mule-track worthy of mention which descends the eastern slope of the Andes. This is in marked contrast to the open, transitable plateaux of the Andean *massif*, which have numerous mule-tracks in all directions, several of which descend to the Beni and Mojos districts of the Amazon basin, and others to Chile and the plains of the Argentine Republic.

Along the Pacific side of Peru, the Cordillera is buttressed with spurs and foothills, which rise from the coast belt of desert lands; and sometimes a short, outlying sierra parallels the main chain; the Negra, in the province of Ancachas, being a good example. Around its northern flank, the *rio de Santa* has carved its way to the Pacific ocean, after having excavated a deep valley in the sierra itself, leaving a sharp crest on either side for over 100 miles. Probably this valley was once a lacustrine basin.

THE ECUADORIAN ANDES.—In northern Peru, and on entering Ecuador, the Andes, which are now low and broken down, seem massed in a broad and capricious single chain, which, however, again bifurcates at the *rio Jubones* ($3^{\circ} 30'$ lat.), in the province of Loja, and thence the coast Cordillera is continuous to the Colombian frontier; but the inland Andes are composed of groups of mountains, sierras, and volcanoes, the axis of which, however, presents a parallelism with the coast range. Between the two ranges lie several plateaux of varying altitude, 7300 feet at Loja, near the Peruvian border, and the same near the Colombian, but generally having an elevation of from 8000 to 10,000 feet. Most of the population of the country occupy the pleasanter and more productive lower levels. The plateaux are much broken by transverse ranges of low hills and terraces, surrounding and defining eight inter-Andean valleys, three of which force their drainage through the eastern Andes to the river Amazon, and five through the Cordillera to the Pacific ocean, through gorges of great depth and grandeur.

The road cuttings of the tableland and the cañons frequently show thick strata of ash and pumice, interstratified with vegetable earth, being a partial record of the numerous eruptions which have marked the fiery geological history of Ecuador. Among its volcanoes are the terrible Cotopaxi and Sangai, which have desolated a vast extent of country.

From Guayaquil to Quito, across the Chimborazo pass, "we ride in the heart of probably the most volcanic region of the world. Mother earth, even in recent centuries, has been torn and twisted into the wildest forms. Beds, from 10 to 20 feet thick, of fine, fragmentary rock are often exposed where the road cuts through a hill slope. I noticed a single fragment, weighing perhaps 40 tons, which must have been thrown from Cotopaxi, 20 miles distant. The highway has deep excavations, often showing successive layers of volcanic material. In one place is a top cap of earth 3 to 6 inches thick, then 12 to 36 inches of pumice, from the size of a pea to that of a pigeon's egg, then 18 inches of earth, then 5 feet of pumice and ash, then about 5 feet of earth, and then, down to a depth of 40 feet below the surface of the cutting, an immense cap of ash and pebbles of pumice. All these beds vary in thickness according to the direction of the wind at the time of their deposit, which, during the eruptions of Cotopaxi, frequently blows with terrific violence. At some points the deposits are light, at others very heavy, and one may thus understand that Cotopaxi could form high hills by its periodic discharges into the vast valleys which it overlooks. The hills which thickly cover the valleys are smooth in appearance. The *tambo* keeper at Machachi says that the last eruption, three years ago, buried the neighbouring country 3 feet in pumice. "It was intensely dark from 9 a.m. to 11 p.m. Cattle, sheep, horses, and birds died in great numbers." *

The volcanic area of Ecuador extends from the border of Colombia to the northern part of the province of Loja, which lies in contact with Peru, and it includes much of the Amazon as well as the Pacific slope. A great number of peaks, from 16,000 to 20,500 feet elevation, are scattered throughout the Ecuadorian Andes, which have probably been as wildly rocked and tossed and rifted by the action of a score of colossal volcanoes as any equal area of the globe.

The Andes, at least within the tropics, are at times a gigantic electric battery, and so highly charged that they are very dangerous to cross. Once, when riding over the Tacora pass, I noticed, for miles, under my iron-shod mule, a continuous discharge of electric flashes from the rocky ground, and the same pyrotechnic display was going on under the mules of my servants. On a subsequent occasion, I observed that certain of the Andean peaks must have magnetic attraction for each

* Extract from Journal of G. E. Church, 1881.

other; for, riding on the Quito plateau, I watched two storms arise simultaneously, one of which centred round the dome of Chimborazo, while the other, 50 miles distant, crowned the summit of Cotopaxi. Blacker and denser grew the frowning clouds, until their artillery opened fire and echo after echo pealed along the line of the Andes. The two angry monarchs had challenged each other to a duel. Suddenly, through the highly electrified atmosphere, Chimborazo shot a hissing bolt straight for Cotopaxi, which in turn launched one at Chimborazo. Then, for perhaps twenty minutes, with a mighty and ceaseless roar, they hurled their well-aimed lightnings at each other, until the battle clouds dispersed and peace smiled again upon their magnificent loneliness.*

The altitude of the Chimborazo pass is 10,417 feet. It is so difficult of transit, especially in the rainy season, that an Italian fellow-traveller remarked to me, as we reached the summit, "No man ought to be condemned to scale it unless he has murdered his father and mother." A fierce blast of wind generally sweeps over it and pelts the traveller with sand and gravel. When I crossed it, my mule found it difficult to keep his feet, and barely escaped being blown over a precipice. My Indian servant told me that "the wrath of the mountain was especially excited by music; and that, even in the calmest day, Chimborazo would launch a hurricane against any one who dared to play a flute or even to whistle along the pass."

South of Chimborazo, and abreast of Guayaquil, is the Chimbo pass, 10,287 feet elevation, and quite as difficult of transit as that of Chimborazo. These are the principal commercial routes between the interior of Ecuador and the outer world; both descend to the Pacific coast, there being no mule-track to reach the Amazon valley except for explorers. There is a rude one connecting with Colombia on the north and Peru on the south, utilized by an occasional traveller or a mule-load of goods, and a similar *possible* one from Loja to Santa Rosa and Machala, near the entrance to the Gulf of Guayaquil, serves for a small traffic.

The inland Andean chain of Ecuador is more massive and continuous than the coast Cordillera. Its volcanoes are also more numerous and formidable, among them being Sangai, Altar, Tunguragua, Cotopaxi, Rumiñahui, Sincholagua, Antisana, Saraurcu, and Cayambé—all igneous vents of such magnitude that, were three or four of them to open fire at once, they could rock the continent. They are more

* Since writing the above, I find that, in a lecture before the Literary Club of Lima, September 20, 1885, Antonio Raimondi said, "In the elevated portion, principally in the Cordillera, during the rainy season, that is from October to May, terrible tempests arise. The snowy range can be compared to an immense electric battery, which in the morning becomes gradually charged with electricity, until two or three o'clock in the afternoon, the hour when the noisy discharges commence."

restless than their neighbours of the coast Cordillera, and in modern times have been the terror of Ecuador. They have spread over their slopes, principally their western ones, many cubic miles of ash, scoria, pumice, and detritus, and the numberless streams which score their flanks transport to the lowlands huge volumes of this material every year.

It is an error to suppose that the Ecuadorian Andes throw great spurs to the east and south-east, for very long distances, between the tributaries of the Amazon; on the contrary, their counterforts are short, and they terminate boldly upon the forested plains, with a few outlying foothills. This is characteristic of the entire mountain border of the Amazon valley, and gives testimony to its ancient lacustrine condition long subsequent to the uplifting of the Andes, to the denudation of which it is largely indebted for its present level. The whole Amazon slope of Ecuador is a densely forested, jungle-tangled, bat and insect-infested region, and uninviting even for the few savage hordes which struggle there for a wretched existence.

Only a very narrow desert belt separates the Cordillera from the Pacific ocean, from the mouth of the Gulf of Guayaquil to lat. 5° . At lat. $3^{\circ} 30'$ is the river Santa Rosa, navigable for barges and small river-steamers to a point about 20 miles from the sea. South of this river, for 2500 miles, there is no Pacific coast stream equally navigable.

The Occidental region of Ecuador, so well and extensively described by Wolf,* is of great interest. There is none similar to it on the Pacific coast of North and South America between the Colombia river and Cape Horn. It is as if some tropical island, in which Nature had lavishly scattered her gifts, had drifted against the base of the Andes and grounded there. It has an area of about 30,000 square miles, and probably, at no very remote geological epoch, consisted of peninsulas and islands, some of which are now hills and ranges of highlands. Occasionally, especially in the central and northern parts, low Andean spurs run westwards towards the ocean. Due to the uplifting of the coast-line and the denudation of the Cordillera, the intervening low areas are now filled with a fine reddish clay-earth of great fertility. In general, these low lands are above flood-line, except in the valleys of the Guayas river system, which are overflowed for several months yearly. The filling-up process is proceeding so rapidly that it threatens to destroy the usefulness of Guayaquil as a port. The whole region is well forested, and offers many valuable woods for shipbuilding and other uses. On the ocean side are several small streams flowing west

* The world owes much to Dr. Teodoro Wolf for his 'Geografía y Geología del Ecuador,' which represents twenty years of intelligent, active, and poorly paid labours. To a large extent, he has evolved order out of the geographical chaos which has characterized all maps of the country made before his time.

from a north-and-south range of hills, about 2500 feet high, which separates their headwaters from the Esmeraldas and Guayas basins, the former having an area of 8500 square miles, and the latter 14,000. Most of the extensive Guayas network of rivers is now utilized for steam navigation. The Esmeraldas has a bad bar at its mouth, which deprives it of any trade of importance, although, inside, it is navigable for a considerable distance. North of this river, in the vicinity of the ocean, commences an immense plain, which extends into Colombia beyond the *rio Mira*.

To paraphrase Wolf, "The Cerro de Cayambé concludes the long series of volcanoes of the eastern Andes; thence, although still very high and very wide, they continue in smooth and tranquil forms beyond the frontier to the north. Only a few isolated mountains rise upon the broad *páramos*. It is true that the Andes, between Cayambé and lake San Pablo or la Cocha, near Pasto, have been but little studied, and it seems that their long and lofty ramifications, extending among the numerous rivers of their oriental slopes, form a very complicated region. Here are the headwaters of the rivers Azuela, Cófanes (Aguarico), Chunguer, San Miguel, and Guames; but the old maps disagree as to their order and direction."

THE COLOMBIAN ANDES.—Entering southern Colombia, the Andes become so massed that, for a distance of from 30 to 40 miles, the two main ranges are almost, but not entirely, united in a single Cordillera. Here, in the vicinity of the towns of Ipiales and Tuquerres, built at an elevation of about 10,000 feet, rise several peaks, varying in altitude from 13,000 to 16,000 feet. At 2° N. lat. the ranges again grandly assume their separate rôles, but the inland one becomes more masterful. Its rocky material is so vast that it throws a huge bastion 50 miles into the Amazon valley, from which a massive and unbroken chain extends north to the Caribbean sea.

The Andean ranges, now three in number, are locally called the "Occidental, Central, and Oriental Cordilleras." The river Atrato separates the first from an outlying, parallel sierra, which borders, and is frequently washed by the waves of, the Pacific ocean, from near Buenaventura, about 4° N. lat., to the Colombian state of Panama. This shore range, known as the Sierra de Baudo, is generally low, its highest peak being only 6000 feet. Its average elevation (Perez)* is from 2600 to 3300 feet, and its lowest depressions 1000 to 1600 feet elevation. In general, it is a pestiferous region, and consists of a chaos of ridges, highlands, and spurs, terribly ravined by torrential rains, thickly forested, and rendered almost impassable by numberless rivers, brooks, and tropical jungles. In the latitude of the Gulf of Uraba, its extensions push into the isthmus of Panama to meet the Costa Rica system of

* 'Geografía Física i Política de los Estados Unidos de Colombia.' Por Felipe Perez.

mountains.* The whole isthmus is forested, and similar in character to the region just described. As far north-west as Puertobelo, a low range of sierras, from 500 to 2700 feet high, borders the Atlantic coast, breaking down, however, at the Chagres river, where the summit, between the two oceans, is only 300 feet elevation; but continuing south-west and west through Veragua, as far as the Costa Rica frontier, the mountains again commence to climb and broaden into a complex and sinuous belt, and, practically, fill the isthmus with knots, hills, spurs, and peaks, rising in their maximum expression to even 7000 feet. West of Montijo bay, a massive counterfort forms the peninsula of Las Palmas, and between that and the bay of Panama, a large knotted and confused group of mountains forms the peninsula of Azuero, with headlands rising to 3000 feet. Throughout the isthmus, there are many *cerros* above 1000 feet in altitude. From its northern slope, 149 short rivers empty into the Atlantic, and from its southern one 326 flow into the Pacific.

The *Occidental* range has a general elevation of 8000 to 9200 feet, and then gradually sinks, until at about 7° N. lat., where the Cerro Paramillo, the highest in the chain, rises to 11,053 feet, it branches into many inferior ridges, which, fan-like, spread themselves over the broad area between the Gulf of Darien and the lower Cauca valley.

The *Central* chain continues northward with numerous terraced counterforts and ramifications and spurs, thrown right and left diagonally into the valleys of the Cauca and Magdalena, but especially into the latter. It develops the same volcanic characteristics as the inland Andes of Ecuador, of which it is the prolongation. Like the *Occidental*, it begins to lose its vigour about 7° N. lat. It then throws out long, low ridges, constantly decreasing in altitude until they break into foothill and outlying elevations, greatly diversifying the country between the lower Cauca and Magdalena rivers.

This range is, throughout, the loftiest of the Colombian Andes, and many snow-peaks and volcanoes give it great majesty. Several domes rise to an elevation of over 16,000 feet, and the superb Nevado del Huila, having an altitude of 18,700 feet, dons a white bonnet which reaches 3000 feet below its crest. About midway of the range, the pass of Quindio (11,400 feet) gives transit between the Cauca and Magdalena valleys.

The *Oriental* range, frequently called the Suma Paz, commencing at the great bastion thrown eastward from the central chain, is, as far as the vicinity of 4° N., a low *divortium aquarum*, separating the upper waters of the Magdalena from those of the Caquetá branch of the Amazon and the Guayabero affluent of the Guaviari. From the above parallel, near which is the imposing snow-peak of Suma Paz (15,777

* See the *Geographical Journal*, July, 1897: 'Costa Rica,' by George Earl Church.

feet), the Andes become higher and more bulky, and broaden to 50 and 100 miles for a distance of 250 miles, as far north as Pamplona. Within this confused, much-broken, and deeply ravined belt lies the historic centre known to the aboriginal inhabitants as Muequeta,* but now called Santa Fé de Bogotá. To the north, the peaks of the chain maintain an altitude of from 11,000 to 11,500 feet, throwing east a great number of ridges, while to the west, at an altitude of above 8000 feet, vast plateaux are found, such as those of Fusagasuga and Bogotá, separated from the Magdalena valley by a secondary range of mountains.

Between the plain of Bogotá and that of Tunja, lying immediately to the north, are the *Paramos*, extending north, east, and west among the high valleys and loftiest plateaux. From profound gorges, separating groups of mountains, the Magdalena river receives a number of affluents. Still further north are peaks above 14,000 feet elevation, and the ice-capped dome of Cocui, or Chita, towers to 19,624 feet, being the loftiest of the *Oriental* Andes.

As regards the remainder of the chain, I quote from Pereira †: "To the north of the *massif* of Cocui, the country, as a whole, should be considered as a grand plateau, cut everywhere by streams tributary to the Magdalena on the west, Lake Maracaibo on the north, and the Orinoco on the east.

"The group of Almorzadero rises to 13,425 feet, on the Mesa Colorada to 13,514 feet; then, to the south of Pamplona, it divides into two branches—one penetrates to the Venezuelan *paramo* of Tama, 13,120 feet elevation; the other extends directly north, throwing right and left numerous counterforts. The Sierra de Ocana, or its *Jurisdicciones*, at certain places descends to 4460 feet, to afterwards rise to 6560 feet; and, for a length of 124 miles, it constitutes the frontier between the state of Magdalena and the republic of Venezuela. In this part of its development, it is known as the Sierra Negra, Valle Dapar, and Perija. It loses itself to the west of the Gulf of Venezuela in the savanas of Goajiros."

The most remarkable mountain group of South America is the volcanic Sierra de Santa Marta—a mighty outpost upon the shore of the Caribbean sea, keeping watch and ward over the northern flank of the Andes. From a base over 5000 square miles in area it raises five magnificent snow-peaks, the highest estimated at over 19,000 feet above sea-level. It is separated from the *Oriental* chain of Colombia by the valley of the *rio* Rancheria, which makes a long curve round the southern and eastern base of the great sierra and discharges into the Caribbean sea.

To the north-east of the Sierra de Santa Marta lies the peninsula

* 'Essai sur l'Ancien Cundinamarca.' Par H. Ternaux-Compans.

† 'Les Etats-Unis de Colombie.' Par Ricardo S. Pereira.

of Goajiro, over 90 miles long. Its first half is low and diversified by a few hills, the highest of which is 1200 feet; but the remainder is traversed by three wild, chaotic, and desolate mountain ranges nearly parallel with each other, and crossing the peninsula from north-west to south-east. The one skirting the north-east front of the peninsula rises at one point to 2600 feet, while the other two show summits above 2000 feet.

THE COLOMBIAN RIVER SYSTEM.—Flowing into the Pacific ocean are the Mira, the Patia, the Dagua, and the San Juan, having respectively, including their branches, 15, 36, 30, and 140 miles of waters, which may be navigated by craft drawing about 4 or 5 feet; the San Juan has a bar covered by only from 5 to 7 feet of water. The navigable rivers flowing northward into the Caribbean sea are the Atrato and the Magdalena, the latter having a great main branch, the Cauca.

The Atrato has its sources in 5° N. lat., at an elevation of nearly 1100 feet. Reclus says, "Thanks to the heavy rainfall of its basin, it discharges a larger volume in proportion to its extent than any other known watercourse." Perez gives it 158 inches yearly. The upper section has carved for itself a profound bed in the narrow valley which separates the *Occidental* from the Pacific shore range. In conjunction with the San Juan, flowing into the Pacific, it nearly cuts this range loose from the *Occidental* one. The water-divide between the two streams is but 361 feet in altitude (Perez), and alone prevents them from becoming a marine strait connecting the Atlantic and Pacific oceans. No doubt such a strait once existed.

The tremendous volume of sedimentary matter which the Atrato carries to the sea has deeply loaded the upper part of the Gulf of Darien, which every year shows less depth of water. The river delta is a vast morass of soft ooze, through which the Atrato has thirteen outlets, eight of which are navigable for small boats, and the others have but 6 feet of water on their bars, breaking off suddenly from 2 to 12 fathoms. The river was surveyed by Commander Lull, U.S.N., for 160 miles up to the mouth of the Bojaya. For the whole distance the banks are submerged, in the rainy season, to a depth of 3 and 4 feet. Long reaches vary from 500 to 825 yards in width. It often exceeds 60 feet in depth, and never less than 28 in mid-river. Its current is from 2 to 3 knots an hour. Large craft can ascend it as far as Quibdo, 250 miles, where a pass, 6800 feet elevation, connects its valley with that of the Cauca across the *Occidental* Andes.

THE MAGDALENA RIVER, the one great commercial artery of Colombia, is confined between the Central and Oriental chains of the Andes, and reaches the sea after a course of 850 miles from south to north. It rises in the *Paramo* de las Papas, in a small lake called el Buey, situated in 1° 58' N. lat., at an elevation of 13,000 feet. It soon leaves the *Paramo*, and, in a winding course of about 40 miles, descends 6500 feet, by a

constant succession of cascades and rapids. At lat. $2^{\circ} 29'$ it is joined by the river Suaza, which almost equals it in volume. From this point onward it receives numerous tributaries, the principal of which, from the right, are the Funza, or *rio Bogotá*, the Carare, Sogamoso, and Cesar; and, from the left, the Paez, the Saldanha, La Miel, and the Cauca.

From its junction with the Paez, it becomes a stream of considerable volume. The *rio Saldanha* is about 160 miles long, and can be ascended 60 miles by boats. Just below it, the Magdalena broadens from 600 to 1300 feet, and has an average depth of 10 to 26 feet; but rises 25 feet more in floods. Further on, the current ceases to be so impetuous, the incline of the river being more regular, but it is, at times, narrowed by the escarpments of the mountains which close in upon it, and at Pescadero, near Honda, it breaks into a short series of cascades and rapids. It then flows rapidly northward to its junction with the Nare, near which it is only about 410 feet wide, between rocky hill slopes, and is very deep.

The river Funza lazily meanders across the tableland of Bogotá, sometimes spreading right and left into lagoons and marshes. Reaching the sloping edge of the plateau, it breaks into a cascade through a gap in the hills about 60 feet wide, and then gives a single leap of about 165 feet, forming the narrow but beautiful cataract of Tequendama. The river then rushes through a rugged gorge to join the Magdalena, descending 6000 feet in its short but wild course.

The principal affluent of the Magdalena is the Cauca, which, like the parent stream, rises in the *Paramo de las Papas*. Its course is governed by the Central and Occidental ranges, between which it flows. Very numerous tributaries increase its volume as it runs north-east to enter the Toba channel of the Magdalena, which, in 1868, became the main one. The principal affluent of the Cauca is the Nechi, up to the mouth of which, a distance of about 130 miles, the Cauca offers precarious navigation for large boats or *champanes*, locally so called. This lower stretch of the river winds through a level, swampy plain; but nearly its whole upper course is a roaring torrent, frequently jammed between mountain spurs, and plunging through gorges over reefs, boulders, and fragments of rock torn from its precipitous banks.

Next to the Cauca, the largest tributary of the Magdalena, is the Sogamoso, and just below the junction the main river is 1900 feet wide. The Sogamoso and its branches are similar in character to the upper and middle Cauca—wild torrents leaping violently along, over cascades and reefs, through deep gorges.

The Cesar has a peculiar course. It rises on the slopes of the Sierra de Santa Marta, and flows south by west along the base of the Oriental Andean range until it enters the Magdalena, a few miles above the mouth of the Cauca.

From 7° N. lat. to the sea, the Magdalena has numerous islands, and frequently sends off lateral channels of considerable volume, which, before they again unite into one main river, envelop long areas of lowlands, forming islands many miles in length and breadth, similar to those of the Orinoco or the Amazon. Occasionally it abandons some of its lateral channels, which become closed for a time, or get choked with rafts of floating trees and tangled vegetation, which, after decaying, are swept away by some great flood, the channel being again restored. Many large lagoons and extensive swamps, flooded to considerable depth in the rainy season, are found inland from the river, and are especially numerous to the east of its course. For a distance of 200 miles before entering the sea, the Magdalena is a broad and beautiful sheet of water.

THE DIQUE, so called, is only a natural channel, or *caño*, 64 miles long, connecting the Magdalena river with the bay of Mantunilla, 10° N. lat., just south of the famous city of Cartagena. From the river, the Dique runs north-westerly to the lagoon of la Cruz, receiving, *en route*, the drainage from a number of lateral valleys and connecting the swamps of Palotal, Corcobado and Mantunilla, and thence turns south-west. Its width varies from 200 to 300 feet, but it has been silted up and choked in some places by vegetation, so that parts of it are sometimes dry or contain but a few inches of stagnant water. The Spanish Government sought to clean out this *caño* and make it the channel for the foreign commerce of Columbia; but the funds set aside for the purpose were maladministered, and nothing was accomplished. As regards the value of the river Magdalena as a commercial avenue, there is an upper navigation between Neiva and Honda, an approximate distance of 200 miles, and a lower of 515 miles between Honda and Barranquilla, which is on the left bank, 15 miles above the mouth of the river.*

At Honda, there are reefs and rapids for a distance of 3 miles. Above these, there is no serious obstacle to navigation for a distance of 95 miles, as far as Purificacion. Above that, for an additional 100 miles, boats may navigate drawing 18 inches of water.

Between Barranquilla and the Honda rapids, for the first 240 miles, say up to Badillo, vessels drawing 5 or 6 feet can run at all seasons; but from Badillo to La Dorada, craft drawing over 3 feet cannot run regularly in summer on account of the shifting sandbanks; and from La Dorada to the Honda rapids the navigation is at all times dangerous. Honda has an elevation of 656 feet, Purificacion 1020 feet, and the river port at Neiva 1702 feet.

The Magdalena has two outlets, the Boca de Rio Viejo and the Boca de Ceniza, the latter about 6 miles west of the former, which, 6 miles from

* Report by Francisco J. Cisneros, F.R.G.S. (1878), an eminent civil engineer, recently deceased, who dedicated his life to the development of Colombian enterprises.

the sea, encloses the densely wooded island of Gomez. The principal entrance is the Ceniza, and, on its bar, the soundings vary from 13 to 15 feet. "Within the past ten years, at least 25 per cent. of the sailing vessels that have visited Barranquilla have been lost on the bar, either going in or coming out; a rolling and treacherous sea exists, in which, even in calm weather, it is difficult for an ordinary ship's boat to live. Many lives have been lost in attempting to sound the bar." *

About halfway between the Magdalena and the Gulf of Uraba, or Darien, the little river Sinu finds its way to the Morosquillo gulf. It is navigable for small craft for about 100 miles, and still further for canoes, although access to the river from the sea is difficult.

PACIFIC COAST PORTS OF COLOMBIA.—The ports of the Pacific coast of Colombia between Ecuador and Panama are numerous, but, with two or three exceptions, inaccessible from the interior, and therefore they can only serve the thickly forested regions which lie upon the western slopes of the coast mountains. The one port of importance is Buena-ventura, lying at the head of the Bahia del Choco, the entrance to which is at 3° 50' N. lat. I have visited very many of the ports of the Pacific coast, and this one I find the most beautiful of them. It is easy of access from the sea, spacious, and affords ample protection and accommodation for ships of large tonnage. It is of primary importance, but between it and the rich Cauca valley lie the *Occidental* Andes, thus far only crossed by a mule-track.

On the south side of the department of Panama, there are thirty small bays, besides the gulfs of San Miguel, Montijo, and Panama. At the head of the latter, all the transit commerce of the isthmus has centred since the days of the Spanish conquest. The other ports have remained in their primitive loneliness.

ATLANTIC PORTS OF COLOMBIA.—On the Atlantic side, between Costa Rica and the Gulf of Uraba, the ports are almost equally numerous, including the great Chiriqui lagoon, San Blas, Caledonia, and Puertobelo; but none of these so favourably situated for easy communication with the Pacific shore as the latter, by the gap of the Chagres river, which has always controlled the position. This stream flows into the Caribbean sea a little to the west of Puertobelo, and, "from its mouth to a point 83 miles west, the shore runs nearly straight, without any sheltered anchorage whatever; and, indeed, without safe landing, except, in native boats under favourable circumstances, at spots known to the coasters and fishermen, for heavy surf breaks continually along the whole shore." †

* 'The Navigation of the Gulf of Mexico and Caribbean Sea.' United States, Hydrographic Office, 1896.

† The coast of Colombia will play such an important rôle when, later, I treat of the Commercial History of South America, that I find it necessary to give many details regarding it and its ports, especially the northern ones, to which the size and draft of Spanish ships had to be adapted.

On the Chagres river bar there are 11 feet of water in the dry season, and just outside is the Laja reef, through which there is a narrow entrance (70 yards) having 14 feet of water. "Within the bar, the water deepens from 17 to 20 feet abreast the town, which is 200 yards above the bar. Here is the anchorage for vessels that can enter. When heavy weather threatens from west to north-east, it is better to put to sea or run for Colon or Puertobelo." A little east of the Chagres river is Colon, or Navy bay, which penetrates $3\frac{1}{2}$ miles inland, is 3 miles wide, depth at entrance about 6 fathoms, and 26 to 28 feet at head of the bay at Colon. It is completely exposed to "northers," sometimes of great violence, during November, December, and January.

Colon is situated on a pestilential morass. The rainfall, mostly in the wet season from April to December, averages about 120 inches.

Over this isthmus route to the Pacific, intermittent, yellow, and other malignant fevers prevail.

Between Colon and Puertobelo is the small harbour of Manzanillo, which has a depth of 2 to 4 fathoms. The coast generally between the two points is frequently bordered by mangrove swamps and reefs, and is most dangerous and uninviting.

We now come to Puertobelo, the best harbour within easy distance of the Chagres' pass across the isthmus, and, consequently, the one selected by Spain for her trade with South America. It is enclosed, to the north and south, by hills of from 600 to 1300 feet elevation, which shut out regular breezes. On the east are fever-breeding swamps. A coral reef skirts the southern shore, and the remains of the city and the ruins of the castle of St. Jerónimo are situated on the beach in the south-east corner. On the north shore are the ruins of the castle of San Fernando. The width of the entrance is $1\frac{1}{2}$ mile, but it soon narrows to half a mile, which is continuous for a mile further up to the head of the bay. The depth gradually decreases to 7 fathoms.

Between Puertobelo and the Gulf of San Blas, there are several small but useless harbours, except that of Nombre de Dios, the entrance to which is skirted by reefs, and the greater part of the interior is also filled with them. Spain abandoned this harbour in favour of Puertobelo.

From Puertobelo to the Gulf of Darien there are also numerous harbours of no commercial importance, and the entire coast-line abounds in reefs, small islands, and dangerous obstacles to navigation.

The isthmus of Panama has had a tragic, if romantic history. Since the days of Balboa, man has been attracted by some evil influence to this fatal strip of land. Here conquest, commercial ambition, and crime have had uncurbed sway, careless of a never-ending record of disaster, dishonour, and death.

There are a number of small, little-used bays and inlets, of local importance only, between the Gulf of Uraba and Cartagena harbour.

The latter is the best port of Colombia on the north coast. It offers ample space and security for large vessels, is about 8 miles in length, from north to south, but is nearly divided in two by the 'Terra Bomba. The city is at the north end of the harbour. The anchorage, which is 3 miles to the south of it, has not less than 8 fathoms of water, and is reached by a channel not less in depth. The inner harbour has a depth of only 6 feet. The natural canal, the Dique, above described, connects it with the Magdalena river. Cartagena was the great rendezvous for the Spanish galleon fleets, preliminary to holding the Puertobelo fair. Further east, and just before reaching the mouth of the Magdalena river, is the fairly good harbour of Savanilla, recently made available and connected with the port of Barranquilla by the engineer Cisneros.

SNOW-LINE.—The snow-line of the Andes varies according to latitude, breadth, and geological character of the mountain masses, direction of the prevailing winds, coast currents of the ocean, and topographical features of the Atlantic slope of the continent; but, in general, between Panama and northern Patagonia, it ranges from 14,000 to 15,500 feet, and even to 16,500 in parts of Peru. South of northern Patagonia, it rapidly descends, until, in Tierra del Fuego, it is as low as 4900 feet.

On the Titicaca tableland, barley does not ripen, and it may be said that above 10,000 feet elevation the bleak valleys and mountain slopes give no adequate response to the food quest of man; but thirsty nature prodigally rewards irrigation when this is applied to the desert lands of the Pacific slope.

THE VENEZUELAN ANDES.—At about 7° N. lat., near Pamplona, the Oriental Andes throw a powerful belt of sierras to the north-east, which, on reaching the state of Carabobo; in Venezuela, bends to the east, and skirts the whole Caribbean sea-frontage of that country as far as the delta of the Orinoco river. The first section is called the Sierra de Merida, the *massif* of which is capped by the Sierra Nevada de Merida, with two grand peaks, one of which is 15,416 feet elevation, and, according to Codazzi, the highest in Venezuela. It is an immense dome in the midst of lofty *páramos* and sierras. South-west and north-west of this *massif* run several very long and imposing main ridges nearly parallel to each other, and between them lie *páramos* of great extent. Throughout the belt are numerous peaks, many of them exceeding an altitude of 13,000 feet.

The *páramos* are arid upland valleys, plateaux, and rocky slopes, having a scanty growth of coarse herbage, mosses, and lichens. They are frequently swept by violent, icy winds and furious storms of cold rain and hail. Travellers dread to cross them, and they are a formidable impediment to trade, especially those lying on the frontiers between Colombia and Venezuela.

The Sierra de Merida terminates on the north-east, at the depression occupied by the headwaters of the Portuguese branch of the river

Apure between Barquisimeto and Cojedes. Here there is a great bend in the Andean range; it turns eastward and continues directly along the 10th degree of north latitude, having several peaks above 5000 feet elevation; but at the Unare river, which it overlooks with a peak 3400 feet high, the range breaks down almost to sea-level for a distance of 35 miles, as far as the Aragua river, which skirts the western base of the Cumaná group of mountains. Here the Andes reappear again, and dominate the delta of the river Orinoco with forest-covered peaks, rising to 5480 and 6740 feet elevation.

At an average of 35 miles north of the range just described lies the lateral ridge which faces and precipitously rises from the Caribbean sea. It extends from the Golfo Triste east to Punta Galera, the north-east cape of the island of Trinidad. In its geological history, it appears to have been terribly torn and rent, as if, in some cataclysm, the Caribbean sea had breached and engulfed it for a length of 140 miles, between Capes Codera and Aragua, leaving in its place a shallow sandy bay, with a low and swampy shore. As the Paria range, it then skirts the Caribbean shore of the peninsula of Paria, preserving a nearly direct line until it reaches the gap called the Bocas de Drago, near which its highest peak rises to 3510 feet. Through this gap the sea connects with the Gulf of Paria, and makes Trinidad an island.

The Caracas section is the highest of this coast chain, its altitude averaging over 5000 feet, about twice that of the inland range; and its principal peaks, Naguayá and the Silla de Caracas, are 9200 and 8650 feet. Between this chain and the inland range lies the garden of Venezuela, the valley of Aragua, one of the most beautiful in South America. At its western extremity is the famous lake of Valencia, 1410 feet above the sea. Its estimated area is 220 square miles.

The large peninsula lying between the laguna of Maracaibo and the Golfo Triste has its western part bounded by a range of highlands which branches roughly north-west from the Merida chain, and terminates on the north at the Gulf of Venezuela or Maracaibo. The remaining portion is much diversified by groups of hills and low sierras, rarely exceeding 2000 feet elevation. The highest, "Cerro San Luis," 4125 feet, is situated about the middle of the peninsula. All the lands are thistle, cactus, and maguey covered, with exception of a few river-valleys, which are fertile and have considerable vegetation. East of the Gulf of Maracaibo is the mountain mass of Paraguaná, connected with the large peninsula just described by a low ridge of sandhills, about 19 miles long and 3 miles wide, which separates the little-known Gulf of Coro, a branch of the Gulf of Maracaibo, from the Caribbean sea. The peninsula of Paraguaná has an area of about 600 square miles, and rises to an elevation of 2885 feet at its highest point.

The northern, ocean frontage of Venezuela, from the western extremity of the Gulf of Maracaibo to the island of Trinidad, is 720 miles in a direct

line. The gulf is 54 miles wide at its mouth, and it extends inland 100 miles. Its prolongation, the Laguna de Maracaibo, having an area of about 8000 square miles, is, in general, navigable for large ships; but, unfortunately, the bars at the entrance do not permit the safe passage of vessels drawing over 10 feet of water, and this against an outflow current of 4 to 5 miles an hour.

The gulf and the laguna are at the bottom of a great depression, and are surrounded by sierras. Some *páramos*, over 13,000 feet high, have their drainage into these vast sheets of water. The shores are low, bordered frequently by immense swamps, and the slopes of the hills and mountains are extensively and densely wooded.

PORTS OF VENEZUELA.—The north coast of Venezuela is deficient in good ports. The principal ones are Puerto Cabello, La Guayra, Carenero, Guanta, and Cumaná. The first is situated at the bottom of the well-named Golfo Triste, in the midst of pestilential mangrove swamps, and the interior of it is difficult for the handling and mooring of ships. Due to English engineering skill and perseverance, a small port, of only 79 acres area, has, under immense difficulties, been constructed at La Guayra, as a shelter against the destructive seas which roll into the roadstead and beat against the mountain wall, behind which, at an altitude of 2880 feet, lies the little valley of Caracas.

VENEZUELAN GUAYANA.—South and east of the Orinoco river, and lying between it and the frontier of Brazil and British Guayana, is Venezuelan Guayana, an enormous area of country, almost as unknown as when Sir Walter Raleigh, following previous Spanish expeditions, was lured to search within its boundaries for the fabled lake of Parima and the Dorado king. It is occupied by perhaps 10,000 semi-savages, who still jealously guard their home against the rapacity and ruthless oppression of the Christian. All information regarding its interior is still vague; but it gradually rises to the south-east, more or less in terraces, as far as the irregular sierras which act as the *divortia aquarum* between it and the Amazon valley. Numerous abrupt, isolated highlands, broken ridges, and granitic masses diversify it and determine the tortuous courses of its almost numberless streams. Scattered over it are densely wooded areas and savanas of great fertility. The mythical Lake Parima is probably one of its periodically inundated districts so common to South America. The tangled and sinuous ranges of highlands which push the Orinoco to the greatest distance westward are said to contain summits rising to 6000 and 8000 feet.

THE BRITISH, DUTCH, AND FRENCH GUAYANAS.—These aggregate about 272,000 square miles. The first is described as a rough, inclined plain sloping from 800 feet elevation to the sea.* The Caribbean sea-frontage is an alluvial flat extending an average of 30 miles inland, and terminating at a range of sand-dunes. Between

* Brown and Sawkins, 'Geology of British Guiana.'

the Essequibo and Corentyne rivers, no part of the country is over 2000 feet high. West of the Essequibo, it is much diversified by groups of mountains and sierras disposed with extreme irregularity, and is, in general, similar in character to Venezuelan Guayana. Extending south-east, from a point a little above the delta of the Orinoco, is the low sierra Itacuna, which forms the watershed between the Caribbean slope and the Cuyuni river, which parallels the sierra, until, at the junction of the Cuyuni with the Essequibo, the range is broken through by the united force of the two rivers, although it shows itself, in low hills, as far east as the river Demerara.

Two mountain systems cross the middle of the country from west to east, the greater consisting of the Pacarima and Merume belt, which is a continuation of the Parima sierra, and the lesser one the Canuco-Camacuma and Corat, extending from the Takuta river to the Essequibo. Further south is the Acarai range, which is the watershed between the Essequibo, the Corentyne, and the Amazon river-basin. Its greatest elevation does not exceed 2500 feet, its northern base being only 800 feet above the sea. It decreases rapidly in height towards the east. The watershed between the headwaters of the Branco branch of the Negro affluent of the Amazon and branches of the Essequibo and other Guayana streams is, according to Brown and Sawkins, only 350 feet above the sea.

Between the Demerara and Corentyne rivers, to the north of 5° N. lat., are many small savanas; but in the beautifully diversified mountainous district south of the Pacarima range there are others very extensive.

The Essequibo river rises in the Acarai mountains, and is 600 miles long, and the Corentyne has its source in 2° N. lat., at an elevation of 700 feet. Both are continuously obstructed by rapids and falls. The former is navigable for 50 miles up to the first rapids, but dangerous shoals obstruct its mouth; the latter has unobstructed navigation for 7 feet draft of water for 150 miles from the sea.*

The topographical and general features of the three Guayanas in question vary but little. Short ranges of highlands and groups of hills, outlined by numerous ramifications of the watercourses, diversify the middle and northern portions of Dutch and French Guayana. Their rivers, except the Surinam, which may be ascended 100 miles from the sea with 10 feet of water, can be penetrated for only a few miles before meeting with rapids, their upper courses being full of obstructions. They are, like British Guayana, covered with a robust and dense tropical vegetation, only interrupted by openings where the soil is too barren for arboreal growth. Occasionally there are savanas, although few far inland. There are many swamps in the hilly districts, transitable

* Schomburgk.

only in the dry season (September and October). The coast-line of Dutch Guayana is a continuous mangrove swamp, that of French Guayana has an occasional hill. The range of Tumuc-Humac mountains, the two highest peaks of which are 1900 and 2624 feet in altitude, forms the water-parting with the Amazon slope. It has a general elevation, according to Coudreau, of about 1200 to 1600 feet in its western and central division, but decreases in height towards its eastern extremity, where it radiates, in several very low broken ridges, between which the rivers Oyapok,* Cachipour, Araguari, and Yari are connected, during the rainy season, by chains of shallow lakes, not even navigable for canoes. The river Oyapok, which rises in the Tumuc-Humac mountains, flows north-east into the ocean at 4° N. lat. Almost mingling its headwaters with those of the Oyapok is the Brazilian river Araguay, flowing south-east to the sea, which it enters near 1° N. lat. Within the triangle thus formed by these two rivers and the Atlantic coast is an area of about 30,000 square miles, wild and almost unoccupied, but having a better climate and covered with more beautiful savanas than can be found anywhere in French Guayana.†

The three Guayanas (British, Dutch, and French) seem to form a region apart from the remainder of South America, and not linked to its general commercial development by inter-State trade. Their settlement and progress must be slow and difficult. They can offer no avenues by which to reach the heart of the continent. They have all been more or less explored, and, in the remote future, their fertile portions may become utilized for an extensive growth of tropical products.

NORTH-EASTERN BRAZIL.—From the Amazon river to Cape San Roque, the north-east point of Brazil, we have a dry, hot, low, sandy sea-coast belt, poorly watered and with scanty vegetation; but, penetrating inland, it is diversified by *campos*, alluvial flats, and broken hills. The highland range of Ybiapaba, which bounds Ceará on the west, has a steep and often precipitous front to the east. It is 2000 to 2400 feet above sea-level, and flat-topped for a width of 32 to 56 miles. Its western slope is easier towards the *rio Parnahyba*. There are occasional forest areas, but generally the country is thinly wooded, and has extensive intermediate areas of porous, sandy soil covered with grass and scrub. Pasture lands are found on the plateaux and sometimes in the river valleys. The whole enormous area east of the Parnahyba and as far south as 14° of latitude is subject to terrible and prolonged droughts, resulting in starvation to its population, more especially in the state of Ceará. West of the Parnahyba, as far as the river

* By a recent award, the Swiss Government has decided the boundary question submitted to it by France and Brazil, and fixed the Oyapok river from its mouth to its source, and the line of the watershed in the Tumuc-Humac mountains, from the source of the Oyapok to the Dutch frontier, as the boundary-line between French Guayana and Brazil.

† Henri Coudreau, 'Dix ans de Guayane.'

Tocantins, there are dense forests. From the former stream to the mouth of the *rio São Francisco*, the coast is fronted by narrow reefs, mostly coralline, which are usually exposed at low water.

RIVER PARNAHYBA.—The Parnahyba is the most important river to the east of the Tocantins for a distance of a thousand miles. Its length is about 850 miles, and its general course north-north-east. Its drainage basin has an area of 133,500 square miles. The main tributaries of the Parnahyba rise in the highlands of Mangabeiras, Gurgueia, Piahy, and Dos Irmãos, the easy slopes of which have their southern drainage into the great river São Francisco and its Preto branch. Although it flows through a low, swampy and unhealthy valley, and has a shallow bed, and is difficult to navigate, still, the Parnahyba and its many branches offer hundreds of miles of navigable waters for craft of light draft. Near its mouth, the river bifurcates, and then, through an enormous and low-lying delta, finds its way into the sea through many canals and channels.

RIO SÃO FRANCISCO.—From about 150 miles north-west of Rio de Janeiro, and almost in contact with the headwaters of the Paraná branch of the Plata, the river São Francisco finds its course of 1800 miles to the sea, which it enters over a shallow bar. It is claimed that its lowest 135 miles are navigable, as also 800 miles of its upper stretches, the remainder being obstructed by great falls and rapids. The Brazilian engineers give the entire river system 4000 miles of navigable lengths. The river flows in a broad valley with tableland bluffs on either side. Sometimes these approach it, but more frequently are from 10 to 20 miles distant. "Forests border the immediate banks, behind which are lower levels of lagoons accompanying the river on its course; they vary in width from a few yards to a few miles, and often extend to the foot of the slopes of the tableland. The greater part of the lowland of the valley, where not swampy, is covered with a dwarfed, scrubby vegetation and tracts of grass lands, with occasional small extents of forest." *

For three-fourths of its course, the São Francisco forms a part of the western boundary of the high maritime tableland and mountain belt of Brazil, which extends from 5° to 30° lat. The coast, nearly throughout, shows a strip of lowlands backed by steep, irregular, and occasionally broken ranges of highlands from 2000 to 4000 feet high. From their gorges and through their foothills numerous short streams find their torrential road to the sea; but many large rivers, such as the Itapicura, Paraguassú, Jaquitinhona, Parahyba, and others in common with the main example, the São Francisco, have cut their way for several hundred miles directly or diagonally across the ranges.

MOUNTAINOUS BELT OF EASTERN BRAZIL.—From Cape São Roque to the

* *Proceedings of the Royal Geographical Society*, June, 1886: "A Sketch of the Physical Geography of Brazil," by James W. Wells.

vicinity of Ouro Preto the broad backbone of the maritime belt, a continuous plateau, varying in width and gradually increasing in altitude, is carved by the rivers into myriad forms. Its general course is south-west, and it is from 100 to 200 miles inland. Near Ouro Preto it merges into the great Serra da Mantiqueira, the highest in Brazil. Its main peak, west of Rio de Janeiro, and 60 miles from the sea, is called Itatiaia-assu, and is 10,040 feet altitude. The range extends south-west, and, reaching the state of São Paulo, joins the Serra do Mar. The latter extends from Cape Frio to the state of Rio Grande do Sul, where it turns inland, crosses the state, and, making a grand curve to the west and north-west, connects, through a hilly section of country, with the Caa-guazú "Cordillera" of Paraguay, but *en route* it is broken through by the Uruguay and Paraná rivers.

Round the magnificent bay of Rio de Janeiro, the rocky range of the Serra do Mar culminates in the Serra dos Orgãos, between which and the Serra da Mantiqueira the forested mountains are grouped in wild confusion, presenting some of the most beautiful scenery in the world.

In the states of São Paulo, Paraná, Santa Catharina, and Rio Grande do Sul, the country, from an elevation of 2500 to 3000 feet along the western drainage shed of the Serra do Mar, slopes towards the Paraná and Uruguay rivers. It forms a part of the Plata valley, and is deeply scored by these streams and their tributaries, which are all more or less obstructed by falls and rapids. It is a vast undulating tableland, extensively forested in the river valleys with fine cabinet woods, especially in the state of Santa Catharina. Towards the north the woodlands thin out, but abound in cedar and pine, the latter being found as far north as 22° lat. Here and there are immense scrub-covered and grassy plains, which offer excellent pasturage. The whole region is the finest in Brazil, and abounds in mineral and forest wealth, pastoral and agricultural possibilities.

The Serra do Mar, after turning inland in Rio Grande do Sul, is divided midway by a north and south range, which, under the name of the Cuchillo Grande, extends into Uruguay, and forms the water-divide between streams some of which flow west to the Uruguay river, and others east to the Atlantic ocean.

URUGUAY.—Uruguay is traversed by numerous, rounded, radiating ridges of very low hills with easy slopes, also called *cuchillos*; but, in the northern part of the state, these occasionally rise to the dignity of highlands, and reach a maximum elevation of 2000 feet. The southern and western half of the state lies from 150 to 300 feet above sea-level. The whole country is covered with a cap of rich, argillaceous earth, and is unquestionably one of the garden spots of South America.

PARAGUAY.—Paraguay, from north to south, has an inland ridge, the "Cordillera de Caa-Guazú," which is a prolongation of the Sierra

Amambay, its north-eastern boundary. From the junction of these two ranges commences the Sierra Mbaracayú, which pushes eastwards, and, crossing the Paraná river at the great falls of Guayra (about 24° lat.), continues, in a low range of hills, in a sinuous course south-east to the Serra do Mar, passing *en route* through the states of Paraná and Santa Catharina.

Part of Paraguay belongs to the valley of the Paraguay river, and part to that of the Paraná. None of its mountain summits exceeds 3000 to 3500 feet altitude. Immense areas of it are covered to a considerable depth by a fertile red earth, representing the decomposition of the sandstone hills.

East and north are trackless virgin forests, but the remaining part of the state is easily transitable by the few roads which have been cut through the bush and smaller forest growth. The river Paraguay and its branches are the principal commercial avenues.

ARGENTINE SOUTH-EASTERN COAST.—South of the estuary of La Plata is Cape San Antonio, from which a broad belt of sand-dunes fronts the entire coast-line of the Argentine province of Buenos Ayres, and extends as far as the mouth of the *rio* Negro; but it is interrupted by Bahia Blanca and the neighbouring *rio* Colorado, the former offering the only port for the entire distance of about 600 miles. Thirty miles north of the estuary of Bahia Blanca, and parallel to it, is a short, isolated range of mountains, the Ventana and Curamalal, the highest peak of which is 3536 feet elevation, according to my own instrumental measurement.

ATLANTIC COAST PORTS.—On the Atlantic side, from the straits of Magellan north, we have, as far as Bahia Blanca, but few good and well-sheltered ports, and the conflicting tides, currents, and winds, added to the dangers from reefs and shoals, make them difficult of access. Bahia Blanca is, however, a harbour easy to enter, spacious and well-protected, and its port is the natural outlet of a vast area of the Argentine Republic. Then follow the river ports Rosario, Buenos Ayres, and Montevideo, the great emporiums of the Plata valley; then Santos and the magnificent, perhaps matchless, bay of Rio de Janeiro; and next Bahia de San Salvador, a great, safe, deep harbour of easy access; then comes the roadstead of Pernambuco, with its interior harbour for small ships, behind a reef; and, finally, the great and excellent river port of Pará, which largely controls the development of the Amazon valley. Besides these, there are many secondary harbours and ports between the mouth of the Amazon and the Rio de la Plata, which increasing commerce will bring into prominence.

PACIFIC COAST PORTS.—The west coast of South America, from the Straits of Magellan to Valdivia, has a great number of useful inlets and bays suited to its very limited commercial requirements; but from lat. 40° to Panama almost all the ports are roadsteads, either wholly or partially exposed to the direct action of the ocean, save a few principal

harbours, such as the spacious and beautiful ones of Valdivia and Talcahuano, the good ports of Lota and Coronel in Arauco bay, the semi-circular one of Valparaiso, exposed to the north, the well-sheltered, large Coquimbo, the somewhat open Caldera, the good port of Taltal, the large but inferior Mejillones, the well-protected and excellent bay of Callao—the best on the Pacific coast of South America—and the very good port of Guayaquil, which, with the ones north of it, have already been mentioned.

I have shown that the marginal belt of South America has, on its western side, an almost impassable rocky barrier; precipitous mountains on the Caribbean sea frontage; broken ranges in all the Guayanas, forbidding easy communication inland; rampart after rampart of highlands and tablelands in Brazil, from Maranhão to Rio Grande do Norte; and thence southward, a steep frontage of highlands in the northern part, and a rocky escarpment the whole length of the Serra do Mar; and, finally, immediately south of the Plata estuary, a broad belt of sand-dunes without a port until Bahia Blanca is reached.

THE GREAT COMMERCIAL DOORWAYS OF SOUTH AMERICA.—What breaks are there in this mountain-fringed continent which offer access to its magnificent interior? Four only: the river Orinoco, the Amazon, the Rio de la Plata, and Bahia Blanca. Of these natural doorways, one belongs to Venezuela, one to Brazil, and two to the Argentine Republic. The ports of Patagonia have relation to Patagonia alone.

The Orinoco, the Amazon, and Plata basins occupy 0·63 (nearly two-thirds) of the continental area. It should, however, be noted that, according to Dr. Bludeau, the united basins of the twin rivers Colorado and Negro of the Argentine Republic have an area 99,500 square miles larger than the valley of the Orinoco, which has 364,500. The Amazon has, if we include the Tocantins, 2,722,000, and the Plata, 1,198,000 square miles. The important secondary basins of South America are the Magdalena, 102,500 square miles; the Parnabyba, 133,500, and the São Francisco, 251,500 square miles. The maritime tract between the Orinoco and the Amazon, including the river-basins of British, Dutch, and French Guayana, has a drainage area of 190,500 square miles; that between the Magdalena and Orinoco, including the Laguna de Maracaibo, 94,500.

THE ORINOCO AND ITS BASIN.—I have referred to the highland district of Venezuelan Guayana, along the western and northern boundary of which the Orinoco finds its way to the sea. There is no more interesting field in South America awaiting exploration. In this region, we have the unknown sources of the Orinoco, which drain the north-western slopes of the Parima range of highlands. In 1857, Michelena y Rojas ascended the Orinoco about 170 miles above its Casiquiare junction to the *rio* Mawaca, and then a few miles up this stream. Beyond these points, the only information we have is that communicated by the

Indians to de la Fuente in 1759, and de Mendoza in 1764, and the subsequent, vague statements of Humboldt regarding the district.

The Orinoco, as far as its junction with the Guaviari, has, in general, a north-west course, and 90 miles before its union with that stream it receives its principal eastern affluent, the Ventuari, which has its unexplored sources in the interior of Venezuelan Guayana.

From the Guaviari, the Orinoco runs nearly north as far as the Apure, where it suddenly takes an eastern course to the sea, receiving *en route*, from the right, the large rivers Caura and Caroni, the latter having a course of about 800 miles, of which 400 miles are navigable.

Between the Guaviari and the Meta, the Orinoco is obstructed by the famous Maipures cataract, where, in several channels, it breaks through a granitic spur of the Guayana highlands for a length of about 4 miles, with a total fall of about 40 feet, and, then, after passing two minor reefs, reaches the Atures rapids, where it plunges through a succession of gorges, for a distance of about 6 miles, winding among confused masses of granite boulders, and falling about 30 feet. It has free navigation for about 700 miles, up to the *raudal* or rapid of Cariben, within 6 miles of the mouth of the Meta, where it is about a mile wide. Thence it gradually broadens, as it continues north, until, at the mouth of the Apure, it is over 2 miles wide in the dry season, and about 7 miles in floods. At Cariben it rises 32 feet, but at the *Angostura*, or narrows, 373 miles from the sea, the flood-line reaches as high as 50 feet above low river, and even attained 60 feet in 1892. The total length of the Orinoco is about 1500 miles, but, if measured by its Guaviari branch, is several hundred miles longer. Like its great rivals in South America, it floods immense areas of country during the wet season, reaching its maximum rise in August. Continuing its eastern course, it enters the sea by its main trunk, the Boca Grande; but, about 100 miles above its mouth, throws a great branch almost directly northward to the Gulf of Paria, a distance also of 100 miles. From the vicinity of this bifurcation, six other considerable arms find their way to the ocean across the vast triangular delta of about 7000 square miles area, which is raised so little above sea-level that much of it is submerged during floods. The delta is covered with a dense vegetation, and cut by a network of *caños* ramifying in all directions among swamps and islands. The Boca Grande is the deepest, and is the main navigable entrance at all seasons, the muddy bar usually maintaining a depth of 16 feet.*

THE APURE.—From the Andean slopes, many great rivers, swollen by numberless tributaries, find their way across the plains and add to the volume of the parent stream. The four main ones are the Apure, the Arauca, the Meta, and the Guaviari. The first proceeds from two

* See map of the Delta of the Orinoco, p. 362.

important streams, the Uribante and Sarare. The former rises in the Sierra de Merida, and has sixteen large affluents; and the latter has its origin near the Colombian city of Pamplona. The Apure is 645 miles long from the junction of these streams to the Orinoco, of which 564 miles are claimed by Codazzi as navigable, although the river has some troublesome rapids 114 miles above its mouth, where it is 3 miles wide. The numerous great tributaries which it receives from the north water the rich and beautiful eastern and southern slopes of the Merida, Caraboso, and Caracas mountains. Some of them are navigable for short distances, and among them the Portuguesa is the most important. It spreads its branches out to the south of Caraboso like a huge fan. It is on the main route between the Caribbean coast and the Venezuelan *llanos*. A few large rivers enter the lower Apure from the south, but they are frequently entangled in lateral canals or *caños*, due to the uniform level of the plains. The waters of the lower Apure, especially during flood-time, have opened a great number of such *caños* before reaching the Orinoco. The plains of the Apure are estimated to have an area of 16,000 square miles.

THE ARAUCA.—South of the Apure, a river of great volume, the Arauca, enters the Orinoco. It rises in the *Oriental* Andes of Colombia, but soon reaches the plain in common with its neighbour, the Sarare affluent of the Apure. This affluent, according to an interesting account given by Perez, has formed a gigantic dam across its own course from the prodigious quantities of trees, bushes, vines, and roots it has torn from its banks, and thus, impounding its own waters, has cut a new channel to the southward across the lowlands and joined the Arauca, from which the Sarare may be reached in small craft and ascended to the vicinity of Pamplona. The Arauca is navigable by large boats and barges up to the Andes, and by sail to its middle course. In floods, unable to carry the additional water contributed by the Sarare, it overflows its banks, and, by several *caños*, gives its surplus to the Capanaparo, which, about 18 miles further south, joins the Orinoco.

THE META.—Between 4° and 6° 30' N. lat., the lofty *Oriental* Andes of Colombia seem to seize the moisture-laden trade winds, which, due to the warm lowlands they have previously traversed, have largely escaped condensation, and wring from them their last drop of water. Countless streams unite as they pour down the mountain gorges to cross the *llanos* by a score of broad, deep channels and contribute to the ever-increasing volume of their grand collecting artery, the Meta,* as it flows onward to the Orinoco. In marked contrast to its northern watershed is its southern one, which gives the parent river but a

* In 1783 the Viceroy Archbishop, Caballero y Gongora, caused a map to be made of the course of the Meta and Orinoco to the sea, with a view to open commerce with Bogotá by that route; but the all-dominating power of Cartagena, backed by Santa Marta, destroyed the effort.

few insignificant tributaries from the plains. The Meta is known as such from the union of two Andean streams, the Negro and Humadea, which rise near Bogotá. At their junction, 700 feet above the sea (Perez), it is 1000 feet wide and 7 feet deep in the dry season; but in flood-time it rises 30 feet. About 150 miles of the lower course of the Meta are really navigable, from the mouth up to the old Apostadero. But it may be ascended about 500 miles by launches, in the wet season, to the junction of the Negro with the Humadea. In the dry season, however, it is obstructed, from the Apostadero up, by reefs, sandbanks, shallows, snags, and floating timber and trees, so that navigation even by canoes is difficult, while the savage hordes along its banks add to the dangers to be encountered.

THE GUAVIARI.—The next great, western tributary of the Orinoco is the Guaviari.* Its headwaters almost interlace with those of the Magdalena river of Colombia. Numerous rapids and falls obstruct its upper reaches, and its middle course is not free from them. It is about 500 miles long, of which 300 are called navigable. Its banks are forested throughout. Two-thirds of the way up from its mouth, it receives its Ariari tributary from the north-west, which is navigable for large boats.† The Guaviari is infested by numerous and ferocious alligators, which attack canoes, as Crevaux found while exploring it. I had a similar experience on the Mamoré river, where one of those gigantic saurians fiercely charged my canoe and nearly overturned it in his effort to seize one of my Indian canoemen. Near its mouth the Guaviari receives the large river Ynirida from the south-west. From the great rapid of Mariapiri, 180 miles up, the Ynirida courses swiftly through a rough country, but, for a long distance above that, it is a succession of lakes and shallow overflowed areas. Its headwaters do not reach the Andean foothills.

The famous Casiquiare “canal” unites the upper Orinoco with the *rio* Negro branch of the Amazon. Although travellers in general give it an elevation of from 400 to 900 feet, it probably does not exceed 335 feet above sea-level. It is about 300 miles long, with an average depth of 30 feet.‡ and has a strong current in the direction of the Negro. From its own extensive drainage basin, it receives several rivers of considerable volume, so that, although where it divides from the Orinoco it is only about 220 feet wide, it swells to five times that width

* Crevaux, in common with many geographers and explorers, gives the name of Guayabero to the Guaviari; but Eugenio Alvarado, of the Spanish commission of limits with Brazil, informed the Viceroy of Bogotá, in 1759, that the Ariari and the Guayabero rise between Neiva and Popayan, between 2° 30' and 3° 30' N. lat. Both run east; the first turns south to enter the second, and, when it joins the Guayabero, it takes the composite name of Guaviari. In the history and pronunciation of those times, they called it Guaibari, or Guayuaire.

† See Crevaux.

‡ Michelena y Rojas, ‘Exploracion Oficial.’

before reaching its Negro outlet, thus showing that the quantity of water contributed to it from the Orinoco is small in comparison to what it gathers *en route*. It is not, as generally supposed, a sluggish canal on a flat tableland, but a great river, which, if its upper waters had not found contact with the Orinoco, would belong entirely to the Negro. The expedition of demarcation of limits of Yturriaga y Solano, in 1756, was the first to verify the statement of the missionary explorer, Padre Roman, in 1743, that the Orinoco sent part of its waters to the Negro by the Casiquiare.*

THE LLANOS.—South of the mountainous district which separates the Caribbean sea from the Orinoco valley, and towards the Orinoco river and its Meta branch, are the *llanos*, having an area of about 200,000 square miles. Probably their present population and products are less than they were four centuries ago. From the edge of the forest-belt, at the foot of the mountains, on the north and north-west, one descends to the true *llanos* by a series of terraces, which are semi-arid, have a gravelly soil, are sometimes rocky, and occasionally cut by deep ravines. These terraces are called the *llanos altos*; but as the Apure river is approached they give place to the *llanos bajos*, which are immense plains abounding in animal-life. They extend south beyond the Meta. Scattered over them are great savanas, dotted at times with groves and thickets, swamps and fresh-water lagoons, and an occasional slight prominence in an apparently unlimited sea of grassy pampa. Tens of thousands of square miles of this region are yearly inundated and enriched by the rivers which overflow their banks. Like the Beni and Mojos plain of Bolivia, it seems an unfinished country, the mountains not yet having sent enough material to the *llanos* to keep them out of water during the entire year. It is a land of extremes, the wet season terribly wet, and the dry one intensely dry. During the latter, dreary wastes of dried-up swamps are occasionally met. The upper *llanos* produce a coarse herbage, but the lower ones are rich in a luxurious growth of fine, succulent grasses, especially to the south of the Apure river. The lower *llanos* are healthy during the dry season of about seven months' duration, but, on account of the miasmas, are pestilential for the rest of the year. The marshes are pestiferous at all times.

Vast areas of Venezuela and Colombia are almost as unknown as they

* A much shorter connection exists to the west of the Casiquiare, between the Orinoco and Amazon basins, by the isthmus of Pimichin. It is reached from the Orinoco river by ascending the Atabapo and its Terni branch. The latter is somewhat obstructed, but could easily be cleared out and made navigable. The isthmus, 10 miles across, has undulations not above 50 feet high, and swamps and marshes. It is much used for the transit of large canoes, which are hauled over it, and thence, by the little river Pimichin, reach the *rio Negro*. A similar portage, only a mile, exists between the upper waters of the Negro and the Essequibo (Wallace, 'Travels on the Amazon and Rio Negro').

were in the early days of the Spanish conquistadores, and the entire country, from British Guiana to the Colombian Andes, and lying south of the Orinoco and its Apure branch, awaits scientific exploration.

THE AMAZON VALLEY.—The part of Brazil lying between the three Guayanas and the lower Amazon river, and bounded on the east by the sea, and on the west by the *rio* Negro, is Brazilian Guayana. It is little known, but is dry and uninviting, from the fact that the north-east trade winds are almost wrung dry by the highlands of all the northern Guayanas, and have but little moisture left when they reach the Amazon slope, especially its eastern half. Forests do not appear except in the few river valleys and on their hilly margins. The rolling tablelands are stony and sandy, and covered with coarse grass, scrubby bushes, and groves of stunted trees. Judging from the distance to the Amazon river from the *divortium aquarum* on the north, the slope of the country must be sharper than that on the southern side of the Amazon, and it is perhaps more diversified; groups of table-topped hills, and at times isolated granitic or gneissic peaks, rise abruptly from the broken plains. Two minor streams, full of rapids, descend from the Tumuc-Humac range, the Yary and the Paron, and flow south-east to the Amazon. The highest elevation between their headwaters and those of the Moroni river, of French Guayana, is but 1300 feet, according to Crevaux. Further west, a little above Obidos, the Trombetas river enters the Amazon, its long course from the Guayana highlands being also frequently interrupted by falls and rapids.* The inferior zone of the river, as far up as the first fall, the Porteira, has but little broken water, and is low and swampy, but above the long series of cataracts and rapids, the character and aspect of the valley completely change, and the climate is much better. The river is navigable for 135 miles above its mouth.

All the Guayanas, Venezuelan, British, Dutch, French, and Brazilian, form an island four or five times the size of France. A tortuous, low chain of mountains, running roughly east and west, cuts it into two nearly equal parts: the northern is saturated and river-torn; the southern is, in general, thirsty and semi-barren, and the driest region of the Amazon valley. It is an area of South America which has been left almost in the undisturbed possession of nomadic Indian tribes, whose scanty numbers find it difficult to solve the food problem.

Lying north of the rivers Napo and Amazon, and south of the Guaviari branch of the Orinoco, and between the Negro and the Andes, is another immense region, the greater part of which is still an unexplored wilderness. What little can be learned regarding it is to the

* In the exploration of this river, the intrepid explorer Henri Coudreau has recently lost his life, thus closing a short but remarkable career of devotion to the scientific examination of many of the affluents of the Amazon. A record of his last work, 'Voyage au Trombetas,' was published only in 1899 by O. Coudreau.

effect that it is of but slight elevation above the sea, and but little broken after leaving the foothills of the Colombian Andes, from which it gently slopes to the south-east in terraces. It seems to resemble the *llanos* of Venezuela in topographical features, but is more extensively wooded.

RIO NEGRO.—This river, the great northern tributary of the Amazon, has its sources along the watershed between the Orinoco and Amazon divide, and also connects with the Orinoco. Its main affluent is the Uaupes, which disputes with the headwaters of the Guaviari the drainage of a section of the eastern slope of the *Oriental Andes* of Colombia. The Negro is navigable for 450 miles above its mouth for 4 feet of water in the dry season, but it has many sandbanks and minor difficulties. In the wet season it overflows the country far and wide, sometimes to a breadth of 20 miles, for long distances; and for 400 miles up, as far as Santa Isabela,* is a succession of lagoons, full of long islands and intricate channels, and the slope of the country is so gentle that the river has almost no current. But just before reaching the Uaupes there is a long series of reefs, over which the river violently flows in rapids, cataracts, and whirlpools. The Uaupes is full of similar obstacles, some fifty rapids barring its navigation, although a considerable stretch of its upper course is said to be free from them, and to gently flow through a forested country. Despite the impediments, canoes can ascend the river to the Andes. San Carlos, near the mouth of the Casiquiare, is estimated by Wallace to be 250 feet above the mouth of the *rio Negro*. After some study of the subject, I think this an excessive estimate. The confluence of the Negro with the Amazon is said to be 85 feet above sea-level.† Probably, this also is too high an estimate.

RIO BRANCO.—The principal affluent of the Negro from the north is the Branco, which is swollen by many streams from the southern slopes of the sierras which separate the Venezuelan and British Guayanas from Brazil. Its two upper main tributaries are the Uraricuera, from the north-west, and the Takutú, which almost links its upper branches with those of the Essequibo. The Branco, then flowing nearly south, is broken by a series of rapids 235 miles above its mouth. It finds its way into the Negro through several channels and chains of lagoons similar to those of the latter river.

THE YAPURÁ.—West of the Negro, the Amazon receives three more imposing streams from the north-west, the Yapurá, the Iça, or Putumayo, and the Napo. The first was formerly known as the Hyapora, but its Brazilian part is now called the Yapurá, and its Colombian portion the Caquetá. Barão de Marajo gives it 600 miles of

* Wallace, 'The Amazon and Rio Negro.'

† Commander Todd, U.S. Navy, Report on voyage of the U.S. steamer *Wilmington* up the Amazon river, 1899.

navigable stretches; but Crevaux, who descended it, describes it as a frightful river, forests, jungles, rapids, cataracts, torrential rains, cannibals, and fevers throughout its course. It rises in the Colombian Andes, nearly in touch with the sources of the Magdalena, and augments its volume from many branches as it courses through Colombia. It was long supposed to have eight mouths, but Ribeiro de Sampaio, in his voyage of 1774, determined that there was but one real mouth, and that the supposed others are all *furos*, or *caños*. In 1864-68 the Brazilian Government made a somewhat careful examination of the Brazilian part of the river, and as far up as the rapid of Cupaty. Several very easy and almost complete water routes exist between the Yapurá and rio Negro across the low, flat, intervening country. Barão de Marajo says there are six of them, and one which connects the upper Yapurá with the Uaupes branch of the Negro; thus the Indian tribes of the respective valleys have facile contact with each other.

THE IÇA, or PUTUMAYO, west of and parallel to the Yapurá, was found more agreeable to navigate by Crevaux. He ascended it in a steamer drawing 6 feet of water, and running day and night. He reached Cuemby, 800 miles above its mouth, without finding a single rapid. Cuemby is only 200 miles from the Pacific ocean, in a straight line passing through the town of Pasto, in southern Colombia. There was not a stone to be seen up to the base of the Andes; the river-banks were of argillaceous earth, and the bottom of fine sand. Codazzi had previously spent a long period of time among its upper branches. Rafael Reyes descended it in 1874, and the following year three small steamers ascended it.

THE NAPO.—The Napo rises on the flanks of Antisana, Sincholagua, and Cotopaxi. Before it reaches the plains, it receives a great number of small streams from impenetrable, saturated, and much-broken mountainous districts, where the dense and varied vegetation seems to fight for every square foot of ground. From the north, it is joined by the river Coca, having its sources in the gorges of Cayambé on the equator, and also a powerful river, the Aguarico, having its headwaters between Cayambé and the Colombian frontier. From the west, it receives a secondary tributary, the Curaray, from the Andean slopes between Cotopaxi and Tunguragua.

From its Coca branch to the mouth of the Curaray, the Napo is full of snags and shelving sandbanks, and throws out numerous *caños* forming jungle-tangled islands, which in the wet season are flooded,* giving the river an immense width. From the Coca to the Amazon, it runs through a forested plain, where not a hill is visible from the river, its uniformly level banks being only interrupted by swamps and lagoons.†

* Orton, 'The Andes and the Amazon.'

† Oculati, 'Esplorazione delle Regioni equatoriali.'

All of these Napo tributaries are practically unexplored, and the *conquistadores* and travellers who have penetrated the Amazon valley from Quito by the historic way of the Napo, or its Coca branch, have been too busy battling with the innumerable obstacles they have encountered to pay much attention even to a rude survey of their route. They have not greatly extended the information given to us by Padre Samuel Fritz in 1686, and other missionaries as early as 1605.

From the Amazon, the Napo is navigable for river-craft up to its Curary branch, a distance of about 216 miles, and perhaps a few miles higher; thence, by painful canoe navigation, its upper waters may be ascended as far as Santa Rosa, the usual point of embarkation for any venturesome traveller who descends from the Quito tableland. The Coca river * may be penetrated as far up as its middle course, where it is jammed between two mountain walls in a deep cañon, along which it dashes over high falls and numerous reefs. This is the stream made famous by the expedition of Gonzalo Pizarro.†

THE NANAY.—The next tributary of the Amazon west of the Napo is the Nanay. It belongs entirely to the lowlands, and is very crooked, has a slow current, and divides much into *caños* and strings of lagoons which flood the flat, low areas of country on either side. It is simply the drainage ditch of districts which are extensively overflowed in the rainy season. Captain Butt ascended it 195 miles, to near its source.

THE TIGRE.—The Tigre enters the Amazon west of the Nanay, and is navigable for small vessels for 125 miles. Like the latter stream, it belongs wholly to the plains. Its mouth is 42 miles west of the junction of the Ucayali with the Amazon.‡

* Villavicencio, 'Geografía del Ecuador.'

† Pizarro reached the Coca from Quito, and with incredible hardships marched the remnant of his numerous expedition down the river-bank to a point below the above-mentioned obstructions. Here he built the "bergantin" in which he afterwards sent Orellana down-stream in search of food, who, finding it impossible to return against the violent current, had no alternative but to continue on and be carried to the ocean by the then unknown Amazon. See Augustin de Carate, 'Historia del Descubrimiento y Conquista de las Provincias del Perú.' Sevilla: 1577.

‡ There is a difference among geographers as to the point where the Marañon ends and the Amazon commences, or whether both names apply to the same river. I am disposed to consider the Marañon as terminating at the natural point, the Pongo de Manseriche, at the base of the Andes, where the head of useful navigation ceases. Upon examination of the hydrographic conditions of the great valley, the convenience and accuracy of this may perhaps be generally recognized. Raimondi terminates the Marañon at the mouth of the Ucayali, Reclus the same, both following the early missionary fathers of the colonial period. M. de la Condamine uses "Amazon" and "Marañon" indiscriminately, and considers them one and the same. Smyth and Lowe give the mouth of the Javari as the eastern limit, as does d'Orbigny. Wolf, apparently uncertain, carries the "Marañon or Amazon" to the Peruvian frontier of Brazil at Tabatinga. Other travellers and explorers contribute to the confusion. It probably arises from the rivalry of the Spaniards and Portuguese. The former accepted the name "Marañon" in Peru, and as the missionaries penetrated the valley they extended the name until they reached the Ucayali, while as the Portuguese ascended the they carried its name to the extent of their explorations.

THE PASTAZA.—Continuing west from the Tigre, we have the Parinari, Chambira, and Nucuray, all short, lowland streams resembling the Nanay in character. We then come to the great river Pastaza. It rises on the Ecuadorian tableland, where a branch from the valley of Riobamba unites with one from the Latacunga basin, and breaks through the inland range of the Andes, and, joined afterwards by several important tributaries, finds its way south-east among the gorges; thence it turns southward into the plains, and enters the Amazon at a point about 60 miles west of the mouth of the Huallaga. So far as known, it is a stream of no value except for canoe navigation. Its rise and fall are rapid and uncertain, and it is shallow and full of sandbanks and snags. Immediately west, and parallel to the Pastaza, flows the Morona, the last stream of any importance before reaching the Pongo de Manseriche. It is formed from a multitude of water-courses which drain the slopes of the Ecuadorian Andes south of Sangai; but it soon reaches the plains, which commence where it receives its Cusulima branch. It is navigable for small craft for about 300 miles above its mouth, but it is extremely tortuous. Canoes may ascend many of its branches, especially the Cusulima and the Miazal, the latter almost to the base of the gigantic volcano of Sangai. The Morona has been the scene of many rough explorations, with the hope of finding it serviceable as a commercial route between the tableland of Ecuador and the Amazon river.

THE PAUTE AND ZAMORA.—A river called the Paute dashes through the eastern Andes from the valley of Cuenca, and a second, the Zamora, has broken through the same range from the basin of Loja. Swollen by many affluents, they reach the lowlands and unite their waters to form the *rio* Santiago, which flows into the Marañon at the head of the Pongo de Manseriche. There is but little known of a reliable character regarding this river, but Wolf says that it is probably navigable up to the junction of the Paute with the Zamora.

THE SOUTHERN DRAINAGE AREA OF THE AMAZON.—Before describing the southern affluents of the Amazon and the Tocantins, it is perhaps well to give a general outline of the region they drain. From the province of Pará one may follow the irregular *divortia aquarum* between the maritime section of Brazil and the Tocantins valley by a broad tableland range, scrub-covered and tufted with wiry grass, which extends south to the headwaters of this river, separating its valley *en route* from that of the Parnahyba and São Francisco, until it connects with the complex mountainous district to the west called the Serra dos Pyreneos, about lat. $15^{\circ} 30'$, and then continues south, and forms the divide between the valley of the São Francisco and that of the Parnahyba tributary of the great Paraná. Then, taking a tortuous course through the state of Minas Geraes, and rising into rolling hills, peaks, and table-topped summits, it merges into the irregular groups of

mountains which surround the headwaters of the São Francisco and Rio Grande branch of the Paraná. From its union with the Serra dos Pyreneos, it has a branch which trends south-west to the city of Goyaz, and thence, in a narrow range of highlands, under the names of Serra dos Divisões do rio Claro and Serra Cayapó, pushes southward to Paraguay, and forms a part of the eastern boundary of that country, under the name of the "Sierra de Amambay." Throughout its length, this extension is a part of the northern and western rim of the basin of the Paraná affluent of the Plata.

North-west of the Serras dos Divisões and Cayapó, which, with their many variously named dependencies, are locally known as the São Lourenço system, is an immense undulating plateau, about 1600 feet average height above the sea, although its northern margin rises at times to above 3000 feet. Between the rivers of the Amazon slope, it descends in vast rolling plains, through which the streams have cut their way down to the underlying rocks. The southern and western edge of the plateau, however, usually terminates in steep bluffs which overlook vast valleys and their ramifications, which the tributaries of the Paraguay river have eroded, frequently to a depth of a thousand feet below the general level of the tableland. The rivers so quickly reach the lower plains that rapids and cataracts are found only in their extreme upper courses.

From Cuyabá north-west to Villa Bella is a great region cut into intricate divisions by countless upper tributaries of the Tapajos, Guaporé, and Paraguay rivers. It is generally arid, with sandy, movable soil, pastureless and almost treeless.*

The Amazon and Paraguay river water-divide is very irregular, and is determined by the high northern margin of the plateau which, on the west, connects with the one lying north of Cuyabá, and then extends north-west into the Serra Parecys, which borders south-western Matto Grosso and overlooks the valley of the Guaporé affluent of the river Madeira for its entire length. It rises above the general level of the country from 1000 to 2300 feet, but gradually breaks down until its low, hilly spurs reach and abut upon the Madeira along its line of falls, where it disappears completely. To the north-east of this serra, between the Tapajos and Madeira rivers, lies an almost unknown area of the Brazilian plateau as large as France.

From the basin of the Tocantins, as far west as the river Madeira, are the remains of an undulating sandstone tableland cut into sections by many watercourses, its irregular elevations, hilly and at times mountainous ridges, mostly flat-topped, presenting bold escarpments overlooking the rivers which are constantly undermining them.

Little is known of the country west of the Madeira river boundary

* Da Fonseca, *op. cit.*

of Matto Grosso, and extending to the range of highlands which determines the course of the Ucayali river of Peru; but the whole region is so nearly level that the great rivers Purús, Juruá, Javary, and minor streams which find their way lazily across it, are among the most crooked in the world. In the rainy season, it is nothing but vast swamps and lakes, and is then uninhabitable.

THE TOCANTINS.—The Tocantins is the great central fluvial artery of Brazil, running from south to north about 1500 miles. It rises in the mountainous district known as the Pyreneos, whilst its more ambitious western affluent, the Araguay, has its extreme southern headwaters on the slopes of the Serra Cayapó, and flows a distance of 1080 miles before its junction with the parent stream, which it appears to equal in volume. Besides its main tributary, the *rio das Mortes*, which enters the Araguay from the west, it has twenty smaller but important branches offering many miles of canoe navigation. In finding its way to the lowlands, it breaks frequently into falls and rapids, or winds violently through rocky gorges until, at a point about 100 miles above its junction with the Tocantins, it cuts across a rocky dyke for 12 miles in roaring cataracts.

The tributaries of the Tocantins, called the Maranhão and Parana-tinga, collect an immense volume of water from the highlands which surround them, especially on the south and south-east. Between the latter and the confluence with the Araguay, the Tocantins is occasionally obstructed by rocky barriers which cross it almost at a right angle. Through these the river carves its way, broken into cataracts and rapids, or *cachoeiras*, as they are called throughout Brazil. Its lowest one, the Itaboca cataract, is about 130 miles above the estuarine port of Cametá, for which distance the river is navigable; but above that it is useless as a commercial avenue, except for laborious and very costly transportation. The flat, broad valleys, composed of sand and clay, of both the Tocantins and Araguay, are overlooked by steep bluffs, those on the east of the Tocantins being especially abrupt. They are the margins of the great sandstone plateaux from 1000 to 2000 feet elevation, through which the rivers have eroded their deep beds. Occasionally, a great sandstone pedestal, much weather-worn, rises from the general level of the tableland, its talus representing the detritus of the slowly disintegrating mass. Around the estuary of the Tocantins, the great plateau has disappeared, to give place to a part of the forest-covered, half-submerged, alluvial plain which extends far to the north-east and west.

THE XINGÚ.—The next large river west of the Tocantins is a true tributary of the Amazon, the Tocantins being still in dispute as such. The Xingú was but little known until it was explored, in 1884–87, by von den Steinen from Cuyabá. Travelling 240 miles east, he found the river Tamitotoaba, 180 feet wide, flowing from a lake 25 miles in

diameter. He descended this torrential stream to the river Romero, 1300 feet wide, entering from the west, and which receives the river Colisú. These three streams form the Xingú, or Paraná-Xingú, which, from 73 miles lower down, bounds along a succession of rapids for 400 miles. It is navigable, for large vessels, for 105 miles above its junction with the Amazon, and at the head of navigation is 6500 feet wide. A little higher up, the river makes an immense bend to the east, to find its way across a rocky barrier. Here is the great cataract of Itamaracá, where the water rushes down an inclined plain for 3 miles, and then gives a final leap, called the fall of Itamaracá.* Near its mouth, the Xingú expands into an immense lake, and its waters then mingle with those of the Amazon through a labyrinth of *caños* winding in countless directions through a wooded archipelago. The country inland from the river on either side is almost unknown.

THE TAPAJOS.—The Tapajos, running through a humid, hot, and unhealthy valley, enters the Amazon 500 miles above Pará, and is about 1200 miles long. It rises on the lofty plateau near Diamantino, in lat. $14^{\circ} 25'$.† This town is seated on the *divide*, its southern slope draining to the Paraguay. Large boats are occasionally dragged across the watershed, a distance of about 20 miles. Castelnau says that 200 metres east of the Fazenda do Estivado the waters of the Arinos flow to the Tapajos, and 84 metres west of the same house is the Trombador tributary of the Cuyabá branch of the Paraguay. The Tapajos is the most western river of Brazil that scores its channel across the vast central plateau lying between the maritime belt and the Madeira.

Near Diamantino, a number of streams unite to form the river Arinos, which, at lat. $10^{\circ} 25'$, joins the Juruena to form the Alto Tapajos, so called as low down as the *rio* Manoel, entering from the east.‡ Thence to Santarem, the stream is known as the Tapajos. The lower Arinos, the Alto Tapajos, and the Tapajos to the last rapid, the Maranhão Grande, is a continuous series of formidable cataracts and rapids. An unobstructed reach of 15 to 20 miles is considered "very long" by Chandless. From the Maranhão Grande to its mouth, a distance of about 188 miles, the river can be navigated by large vessels. At Santarem, where the Amazon makes an unsuccessful attempt to choke it with sediment, it is less than three-quarters of a mile wide and 130 feet deep, and its black waters have almost no current.§ Below the last rapid, it gradually broadens out until its last 100 miles is from 4 to 9 miles wide, and much of it very deep. In the dry season the

* Prince Adalbert, of Prussia, entered the Amazon in 1842, fitted out a canoe expedition, and, overcoming many of the cataracts and rapids of the Xingú, reached a point about 400 miles above its mouth.

† Chandless, *Journal Royal Geographical Society*, vol. 32.

‡ Coudreau, 'Voyage au Tapajos.'

§ R. H. Smith, 'Brazil, the Amazon and the Coast.'

ocean tides are felt as high up as the head of navigation, but the slope of the river may be gauged by the elevation of the Salto Augusto, which, at lat. $8^{\circ} 53'$, is 1475 feet according to Condrea.

The valley of the Tapajós is bordered on both sides by bluffs, which are the margins of the great tableland. They are from 300 to 400 feet high along the lower river, but a few miles above Santarém, they retire from the eastern side, and only approach the Amazon flood-plain some miles below Santarém.

THE MADEIRA AND ITS AFFLUENTS.—The river Madeira has its junction with the Amazon 870 miles above Pará, and almost rivals it in the volume of its waters. It rises over 50 feet during the rainy season, and the largest ocean steamers may ascend it to the fall of San Antonio, 663 miles above its mouth; but in the dry months, from June to November, it is only navigable for the same distance for craft drawing from 5 to 6 feet of water. San Antonio is, according to the survey of Captain Selfridge, U.S. Navy, 1533 statute miles above Pará by river route.* Lieut. Perkins, U.S.S. *Enterprise*, determined its longitude west of Greenwich at $63^{\circ} 55' 14''$ and lat. $8^{\circ} 48' 14\frac{1}{2}''$, after numerous observations. In 1877, I sent an ocean steamer drawing 18 feet of water from Philadelphia to San Antonio.

The Madeira river commences at the confluence of the river Guaporé with the Mamoré.† Both of these streams have their headwaters almost in contact with those of the river Paraguay. Many writers have pointed out the ease and importance of cutting “a short canal” to give continuous inland navigation between the Amazon and Plata basins. Such an idea is based on ignorance of local conditions; hundreds of miles of rivers would have to be freed from obstructions and deepened before a route could be opened to serve for craft of even twenty tons burden.

San Antonio is the first of the formidable series of cataracts and rapids, nineteen in number, which, for a river distance of 263 miles, obstruct the upper course of the Madeira, until the last rapid, called Guajará Merim (or “small pebble”), is reached, a little below the union of the Guaporé with the Mamoré. The junction of the great river Beni with the Madeira is at the “Madeira” fall, a vast and grand display of reefs, whirlpools, and boiling torrents, among which I was wrecked in 1872. Between Guajará Merim and this fall, inclusive, the Madeira

* In 1877 I went to Washington especially to explain to President Grant the great need of a survey of the lower Amazon and Madeira rivers. He recognized it at once, and almost immediately despatched the U.S.S. *Enterprise* to map these rivers as far as San Antonio.

† The Guaporé, although 1900 feet wide at its mouth, is, owing to less depth, inferior in volume to the Mamoré, although this is but 1300 feet wide at the junction. The Beni and Madeira at their confluence have, during the whole year, almost exactly the same cubic volume and discharge according to Keller's measurements.

receives the drainage of the north-eastern slopes of the Andes from Santa Cruz de la Sierra to Cuzco, the whole of the south-western slope of Brazilian Matto Grosso, and the northern one of the Chiquitos sierras—an area about equal to that of France and Spain.* The waters find their way to the falls of the Madeira by many great rivers, the principal of which, enumerating them from east to north-west, are the Guaporé or Itenez, the Baures or Blanco, the Itonama or San Miguel, the Mamoré, Beni, and Amarú-mayú or Madre de Dios, all of which are reinforced by numerous secondary but powerful affluents. The Guaporé presents many difficulties to continuous navigation; the Baures and Itonama offer hundreds of miles of navigable waters through beautiful plains; the Mamoré I have personally sounded, in the driest month of the year, for a distance of 500 miles above Guajará Merim, and found never less than from 10 to 30 feet of water, with a current from 1 to 3 miles an hour. I had its *rio Grande* branch explored, and it was reported navigable, for craft drawing 3 feet, to within 30 miles of Santa Cruz de la Sierra—a level, sandy plain intervening. The *rio Grande* is a river of enormous length, rising in a great valley of the *massif* of the Andes between Cochabamba and Sucre, and having its upper waters in close touch with those of the Pilcomayo branch of the great river Paraguay. It makes an enormous bend to the south-east, then runs north, and, curving to the north-west, joins the Mamoré at about lat. 15°. Its length is probably over 800 miles. Throughout its course it receives numerous torrential branches. The Chaparé, Securé, and Chimoré tributaries of the Mamoré are navigable for launches, up to the base of the mountains, within 130 miles of Cochabamba.†

The Beni has a fall, 18 miles above its mouth, called the Esperanza; beyond this, it is navigable for 217 miles to the port of Reyes, although, during the three dry months of the year, there are several shoals which can only be passed by craft drawing not more than 2½ feet of water. The extreme upper branch of the Beni is the river La Paz, which rises on the inter-Andean tableland near lake Titicaca. It runs in a deep cañon through the city of La Paz, winds around the south-western base of Illimani, saws through the inland range of the Andes in a deep gorge, and races down the mountain

* This drainage area gives the river Madeira a discharge among the falls of 305,616 cubic feet per second, according to the measurement of the engineer Keller. Its width along the falls varies from 1200 to 6600 feet, and its maximum depth 122 feet.

† The first steam craft to navigate the Madeira river and branches above the falls, was the *Explorador*, a little screw-steamer 40 feet long, built of Low-Moor iron, and not in sections. In 1871 I descended the falls with an expedition to meet her at San Antonio. The task of placing her upon the Mamoré, above the 263 miles of tremendous cataracts and rapids, I intrusted to Dr. Juan Francisco Velarde, a Bolivian of masterful energy and intelligence. He frequently had to haul her overland for miles through the tropical forests, and during the rainy season. He accomplished his task with superb courage, skill, and endurance.

slope to the Beni river. The La Paz and Beni as far down as Reyes are a torrent.

The principal branch of the Beni enters it 120 miles above its mouth, and is known as the Mayu-tata.* Its ramifications drain the north-eastern slopes of the Andes lying between 12° and 15° of latitude, and it greatly exceeds the Beni in volume. It was long thought to be a tributary of the Purús, until the brave but ill-fated Maldonado demonstrated that it belonged to the Madeira river system. It is navigable, in the wet season, to the base of the Andes, to within about 180 miles of Cuzco. Its upper waters are separated from those of the Ucayali† by only a short, transitable portage. When, however, the river is low, it is obstructed by several shoals and violent but surmountable currents, and its middle course has two rapids, each with the usual "head, body, and tail." It has sixty-three islands, great and small, from its mouth to its principal affluent, the Inambari (about 500 feet wide), which joins it from the south, flowing along the base of the Andes. General Pando, Colonel Juan Muñoz, and M. V. Ballivian, able and enthusiastic Bolivian explorers, the first now President of Bolivia, have given us interesting descriptions of the Mayu-tata and its navigability. Its bed is definitively formed, its banks solid, and the country it traverses is picturesque, and frequently of exceeding beauty.

All of the upper branches of the river Madeira cross the almost level Mojos and Beni plains, which rival, if they do not exceed, in fertility the Egyptian valley of the Nile, and are the most inviting and healthy agricultural and grazing region of the basin of the Amazon.

THE PURÚS.—This very sluggish river enters the Amazon west of the Madeira, which it parallels as far south as the falls of the Madeira. It runs through a continuous forest at the bottom of the great depression lying between the edge of the Brazilian sandstone plateau, skirted by the Madeira river, and the Ucayali, which hugs the base of the Andes. Chandless found its elevation to be only 107 feet above sea-level, 590 miles from its mouth. It is one of the most tortuous streams in the world, and its length in a straight line is less than half that by its curves. It is practically only a great drainage

* The numerous names given to this river by missionaries, historians, and explorers have greatly confused the geography of this part of South America. It has been called the Tono, Manú, Maynú, Manútata, Mayu-tata by the Tacana Indians who live along its banks, the Rio de Castella, Parabari, Manuariritya, and, by Padre Revello, the Madre de Dios. I prefer the Indian name, Mayu-tata.

† In 1894, a rubber-collector, Carlos Fermin Fiscarrald, having his establishment at the junction of the Tambo and Urubamba affluents of the Ucayale, ascended to the headwaters of this stream, and, "in 55 minutes," marched his party over the divide to the waters of the Mayu-tata. He hauled his small canoes across, built a large one, and descended this river to the settlements of the Bolivian rubber-collectors. *Vide* Official Report, Dr. Roman Paz.

ditch for the lake-flooded district it traverses. Its width is very uniform for 1000 miles up, and, for 800 miles, its depth is never less than 45 feet. It is navigable by steamers for 1648 miles, as far as the little stream, the Curumahá, but only by light-draught craft, which must be short to round the sharp bends of the river. Its branches add about 800 miles to its navigable waters. Chandless, that model explorer, ascended it, in 1864-5, for 1866 miles. At 1792 miles, it forks into two small streams. Occasionally a cliff touches the river, but, in general, the lands are subject to yearly inundations throughout its course, the river rising at times above 50 feet, the numerous lakes to the right and left serving as reservoirs. There are but seven islands in the whole river. Its main tributary, the Aquiry, or Acre, enters from the right, about 1104 miles above the Amazon, in lat. $8^{\circ} 45'$ and long. $67^{\circ} 23' W.$ from Greenwich. Its sources are in the high country lying north-west of those of the Mayu-tata; and, still further in the same direction, the Purús itself rises upon the slopes of the highlands which define the course of the upper Ucayali, which can be reached from the Purús by a portage of only a few miles, according to information obtained by Chandless from the Indians.

Many unsuccessful efforts have been made to find, what probably does not exist, a commercial route to the Beni districts by the rivers Purús and Aquiry, feasible during the entire year. The latter is navigable for a period of only about five months of the year, when the Purús valley below the Aquiry is inundated; and for the remaining seven months, only canoes can ascend it sufficiently high to communicate overland with the settlements in the valleys of the Mayu-tata and lower Beni; thus these regions are forced to seek communication with the Amazon river by the very dangerous, costly, and laborious route of the falls of the Madeira.

THE JURUÁ.—West of the Purús, and having about two-thirds of its volume, is the Juruá river, also rising among the Ucayali highlands, and sharing with the Purús the bottom of the immense inland Amazon depression, and having all the characteristics of the latter river as regards curvature, sluggishness, and general features of the low, half-submerged forested country it traverses. Chandless found it navigable and unobstructed as far as he ascended, a distance of 1133 miles above its junction with the Amazon. At the highest point he reached, the river was still 30 feet deep.

THE JAVARY.—The Javary, west of the Juruá, is the next important affluent of the Amazon from the south. It is the boundary-line between Brazil and Perú. It is supposed to be navigable by canoe for 900 miles above its mouth, to its sources among the Ucayali highlands, but only 260 miles have been found suitable for steam navigation. The Brazilian Boundary Commission ascended it in 1866 to the junction of the Shino with its Jaquirana branch. The country it traverses, in its extremely

crooked course, is very level, similar in character to that of the Juruá, and is a forested wilderness occupied by a few savage hordes.

THE UCAYALI, which rises only about 70 miles north of Lake Titicaca, is the most interesting affluent of the Amazon next to the Madeira. Perú has fitted out many costly and ably commanded expeditions to explore it. The first steamer ascended the Ucayali in 1866; the second expedition, of three small steamers, in 1867, claimed to have reached within 240 miles of Lima, and the smallest of them, the *Napo*, forced its way up the violent currents for 77 miles above the junction with the Pachitea river, as far as the mouth of the river Tambo, or Apurimac, 772 miles from the confluence of the Ucayali with the Amazon. The *Napo* then succeeded in ascending the Urubamba branch of the Ucayali 35 miles above its union with the Tambo, to a point 200 miles north of Cuzco. The remainder of the Urubamba, as shown by Bosquet in 1806, and Castelnau in 1846, is useless for commercial purposes; the latter describes it as constantly interrupted by cascades, reefs, and numberless other obstacles. The Tambo, or Apurimac, branch of the Ucayali, which rises in the Vilcanota knot of mountains south of Cuzco, is a torrential stream throughout its course, interrupted by reefs, cascades, and innumerable obstacles which render it unfit for navigation.

Admiral Tucker, who commanded the above-named expedition of 1867, found the mouth of the Tambo to be in lat. $10^{\circ} 41'$ and long. $73^{\circ} 14'$ W. from Greenwich, and 861 feet above sea-level. With a specially built steamboat, the *Tambo*, in 1870, he again reached the river Tambo; but 9 miles up this stream encountered a 7-mile current, which landed his vessel on a gravel bank and kept her there for a month, until January 3, 1871. Continuing up-stream, he found a 10-mile current, the incline of the river-bed being over 4 feet per mile. Two days after, and 45 miles up the Tambo, he reached the junction of the Ene and Perené, lat. $10^{\circ} 58'$ and long. $70^{\circ} 26' 30''$, elevation 1000 feet. He then ascended the latter stream 15 to 20 miles, where he found very dangerous and insuperable rapids between enormous walls of rock, and, a mile further up, a cascade full of colossal rocks. He observed that the banks of the Ucayali for 500 miles up were generally very low. They are, in fact, overflowed in the wet season, and the neighbouring country extensively inundated.*

THE HUALLAGA.—The Huallaga, which joins the Amazon to the west of the Ucayali, rises high among the mountains, in about $10^{\circ} 30'$ lat., on the slopes of the Cerro de Pasco. For nearly the whole of its length, it finds its way through a succession of gorges, an

* "The lower Ucayali, for 279 miles up, varies much in breadth, being in some places fully a mile and a half across, and in others not above half a mile. It runs from 3 to 4 miles an hour, and its average depth is 12 fathoms" (Smyth and Lowe, 'Narrative of a Journey from Lima to Pará').

impetuous torrent running seldom less than 6 miles an hour. Besides forty-two rapids, it has other formidable impediments to navigation, among which are many floating trees and snags. The last obstruction is the Pongo de Aguirre, so called from the traitor Aguirre, who passed there. The Huallaga can be ascended to this point by large river steamers, a distance of about 140 miles. Between the Huallaga and the Ucayali lies the celebrated "Pampa del Sacramento," a level region of stoneless, alluvial lands entirely covered with thick, dark forests, first penetrated by the missionaries in 1726. It is about 300 miles long from north to south, and varies in width from 40 to 100 miles. Many streams offering canoe navigation rise in the interior of this region. Some of them flow to the Ucayali, and others to the Huallaga. It is still occupied by savage tribes.

THE MARAÑON.—It is generally stated by geographers that this river rises in the little lake Lauricocha, in $10^{\circ} 30'$ S. lat., and 100 miles north-north-east of Lima. They appear to have followed the account originally given by Padre Fritz, which has since been found incorrect. According to Antonio Raimondi, the small stream issuing from the lake, and afterwards known as the Marañon, has a branch called the Nupe, of much longer course and greater volume than the outflow stream of the lake. The Nupe is, therefore, the extreme source of the Amazon river. The Marañon flows through a deeply eroded Andean valley, in a north-west direction, along the eastern base of the Cordillera of the Andes, as far as lat. $5^{\circ} 36'$; then it makes a great bend to the north-east, and, with irresistible power, cuts through the inland Andes, until, at the Pongo de Manseriche, it victoriously breaks away from the mountains to continue on through the plains under the name of the Amazon. Barred by reefs, and full of rapids and impetuous currents, it cannot become a commercial avenue. At the point where it makes its great bend, the river Chinchipe joins it from southern Ecuador, the mouth of this stream being in lat. $5^{\circ} 28'$ and long. $78^{\circ} 33'$ W. from Greenwich. Just below this, the mountains close in on either side of the Marañon, forming narrows or *pongos* for a length of 35 miles, where, besides numerous whirlpools, there are no less than thirty-five formidable rapids, the series concluding with three cataracts just before reaching the river Imasa, or Chunchunga, near the mouth of which La Condamine embarked in the last century to descend the Amazon. Here the general level of the country begins to decrease in elevation, with only a few mountain spurs, which from time to time push as far as the river and form *pongos* of minor importance and less dangerous to descend. Finally, after passing the narrows of Guaracayo the *cerros* gradually disappear, and, for a distance of about 20 miles, the river is full of islands, and there is nothing visible from its low banks but an immense plain covered with impenetrable forests. But the last barrier to navigation has yet to be passed—the Pongo de Manseriche, 3 miles

long, just below the mouth of the Rio Santiago, and between this and the old abandoned mission station of Borja, in lat. $4^{\circ} 28' 30''$ and long. $77^{\circ} 30' 40''$. According to Captain Carbajal, who descended it in the little Peruvian steamer *Napo* in 1868, it is a vast rent in the Andes about 2000 feet deep, narrowing in places to a width of only 100 feet, the precipices seeming to close in at the top. Through this dark cañon the Marañon leaps along, at times, at the rate of 12 miles an hour.*

THE AMAZON'S MAIN RIVER.—The Amazon river is navigable for ocean steamers as far as Iquitos, 2300 miles from the sea, and 486 miles higher up, for vessels drawing 14 feet of water, as far as Achual point. Beyond that, according to Tucker, confirmed by Wertheman, it is unsafe; but small steamers frequently ascend to the Pongo de Manseriche, just above Achual point. The average current is about 3 miles an hour; but, especially in flood, it dashes through some of its contracted channels at the rate of 5 miles. The U.S.S. *Wilmington* ascended it to Iquitos in 1899. Commander Todd reports that the average depth of the river, in the height of the rainy season, is 120 feet. During the period of its rise, it carries an immense quantity of drift-wood, and much of this, of great specific gravity, sinks to the bottom, as it becomes water-soaked. In the vicinity of Obidos, when the river is at its lowest level, at the beginning of November, a sudden rise is noticed; but it soon lowers again. It is the herald of winter. Some days later there is another rise, and on the second or third day the waters remain stationary and neither rise nor fall until this second impulse is at an end; then the river constantly increases in volume until June, when it reaches its maximum flood-level, and then falls until the end of October.† Wallace says that the waters begin to fall about June 21, seldom varying from that period. The rise of the Negro branch is not synchronous, for the steady rains do not commence in its valley until February or March. By June it is full, and then it begins to fall with the Amazon. According to Bates, the Madeira “rises and sinks” two months earlier than the Amazon.‡

The Amazon at times broadens to 4 and 6 miles. Occasionally, for long distances, it divides into two main streams, with inland lateral channels, all connected by a complicated system of natural canals

* Perhaps the most daring deed of exploration ever known in South America was done by the engineer A. Wertheman. He fitted out three rafts, in August, 1870, and descended this whole series of *pongos* from the *rio* Chinchipe to Borja. The thirty-five upper rapids and three cataracts he descended in six hours. At one point the river gradually narrowed, and was precipitated down an inclined plain between vertical walls not a hundred feet apart, until it reached the cataract of Mayasi, 15 feet high, over which his rafts were launched as if from a catapult.

† ‘A região Occidental da Provincia do Pará.’ D. S. H. Penna.

‡ From a river-level gauge which I had kept at São Antonio, on the Madeira (low-

cutting the low, flat *igapó** lands into almost numberless islands. At the narrows of Obidos, 400 miles from the sea, it is compressed into a single bed a mile wide and over 200 feet deep, through which the water rushes at the rate of 4 to 5 miles an hour.

Travellers agree that the river may be ascended for hundreds of miles by side channels, winding through lakes and canals in the heart of virgin forests, without ever once entering the main stream. In the rainy season, it inundates the country throughout its course, to the extent of several hundred thousand square miles, covering the flood-plain, called *vargem*; and Wallace says that from the mouth of the Negro to that of the Iça, far in the interior, and even near the sources of the Negro, and on the upper waters of the Uaupés, are extensive tracts of land which are annually overflowed. Flood-levels above low river are in places from 40 to 50 feet high. Taking four about equidistant places, the rise at Iquitos is 20 feet; at Teffé, 45; near Obidos, 35; and at Pará, 12 feet.†

The first 200 miles of the northern margin of the Amazon are very low, and the great plains of Brazilian Guayana, which lie inland from the river, are at times almost entirely flooded.

The first high land met in ascending the river is on the north bank

water mark at the base of the fall being fixed at 150 feet), the following were the results obtained:—

	1872.	1873.	1874.	1878.
January	—	183·89	187·00	—
February	—	192·21	188·09	—
March	—	196·43	194·21	—
April	—	192·23	—	185·70
May	—	185·06	—	179·50
June	—	177·20	—	170·92
July	—	171·12	—	162·00
August	150·00	164·74	—	149·95
September	150·18	156·53	—	140·02
October	150·66	158·93	—	150·72
November	159·14	159·33	—	159·21
December	176·80	176·70	—	165·93

It will be seen that the rise in November and December corresponds to that of the Amazon near Obidos. It is evident, however, that both the rise and fall of the Madeira, and probably of the Amazon, fluctuates greatly according to the irregular annual rainfall of its basin, which at São Antonio, as shown by the rain-gauge, was, for 1873, 91·32 inches. May, June, July, and August were very dry, giving 9 inches of rain in 1873, and under 5 inches in 1878 during the whole four months. It would take the Madeira flood-wave about eight days to reach the Amazon from São Antonio.

* On the Amazon, the inhabitants distinguish the marginal lands as *igapó*, which is never more than 15 feet above low water; *vargem*, the land which by successive deposits has risen above the ordinary middle level of the river, and which is submerged at high water; and *terra-firma*, which the river never overflows, and which is the yellow-red clay, topped by thick forests, common to the entire river valley.

† See sketch-map of the Amazon near the mouth of the Tapajos, p. 383.

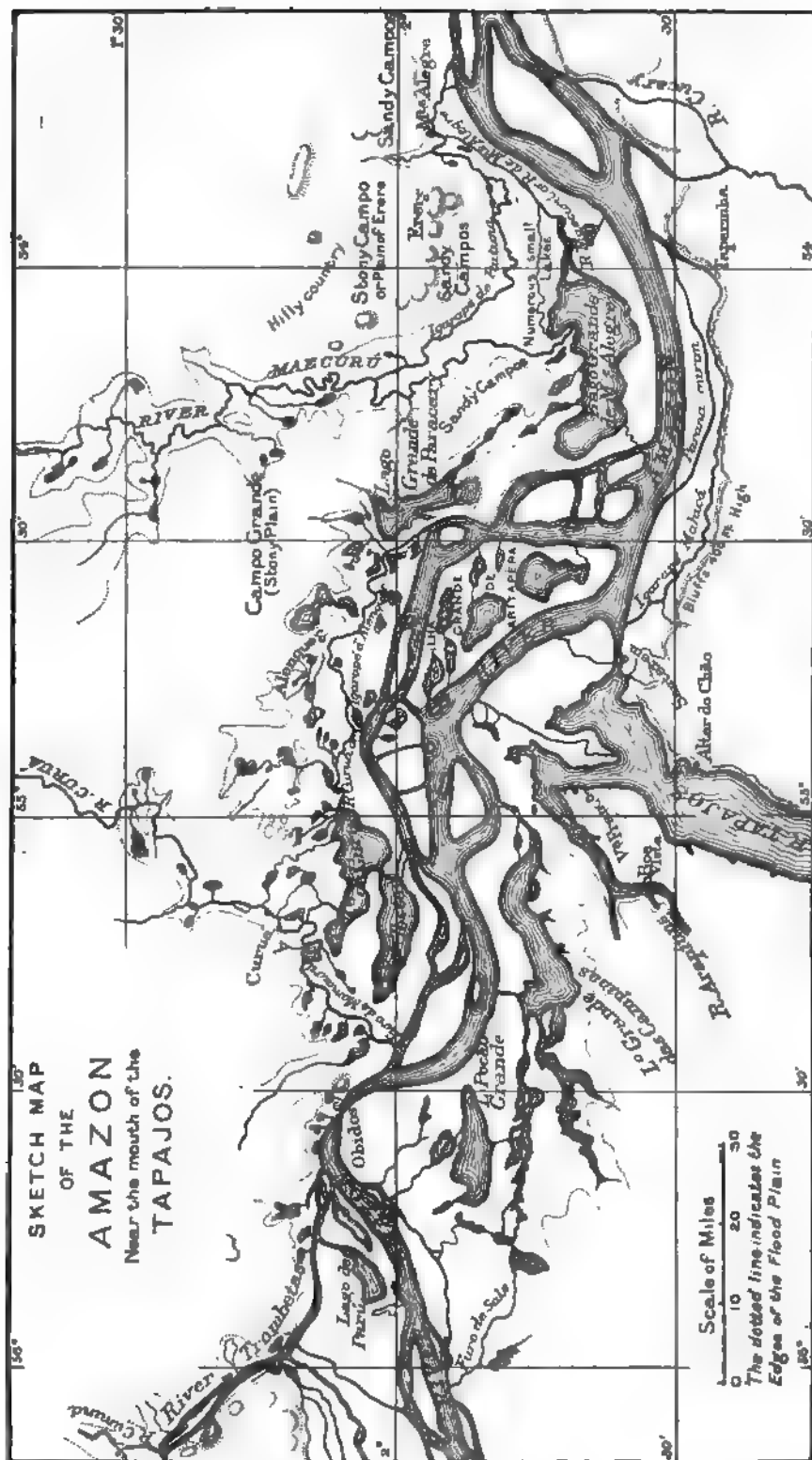
opposite the mouth of the Xingú, and extends for about 150 miles up as far as Monte Alegre. It is a series of steep, table-topped hills cut down to a kind of terrace which lies between them and the river. Monte Alegre reaches an altitude of several hundred feet. Inland and westward of it are the rugged hills of Ereré, 1000 feet high.

On the south side, above the Xingú, a line of low bluffs extends in a series of gentle curves with hardly any breaks nearly to Santarem, but a considerable distance inland, bordering the flood-plain, which is many miles wide. They then bend to the south-west, and, abutting upon the lower Tapajos, merge into the bluffs, which form the terrace margin of that river valley.

The next high land on the north side is Obidos, a bluff 56 feet above the river, backed by low hills. From Serpa, nearly opposite the mouth of the river Madeira, to near the mouth of the Negro, the banks are low, until approaching Manaos they are rolling hills; but from the Negro, for 600 miles, as far up as the village of Canaria, at the great bend of the Amazon, only very low land is found, resembling that at the mouth of the river. Vast areas of it are submerged at high water, above which only the upper part of the trees of the sombre forests appear. At Canaria, the high land commences and continues as far as Tabatinga, and thence up-stream. On the south side, from the Tapajos to the Madeira, the banks are usually low, although two or three hills break the general monotony. From the latter river, however, to the Ucayali, a distance of nearly 1500 miles, the forested banks are just out of water, and are inundated long before the river attains its maximum flood-line. Thence to the Huallaga, the elevation of the land is somewhat greater; but not until this river is passed, and the Pongo de Manseriche approached, does the swelling ground of the Andean foothills raise the country above flood-level.

Chandless, Keller, and Commander Todd appear to agree the best as regards the height of the Amazon above sea-level in the vicinity of the Purús, Madeira, and Negro.* Although their average would be only about 100 feet at about 1000 miles from Pará, my conviction is that it is far too high an estimate, and that the Amazon at the mouth of the river Javary, over 2000 miles from the sea, is not over 30 feet above the narrows at Obidos, and that whatever elevation there may be is due to the river having built up its own bed, and that the rise between sea-level and the narrows at Obidos, 523 miles above Pará by the river, is not over 6 feet. The tides, which at Pará are 12 feet, are

* There is so much divergence among explorers in the barometric measurements they have taken on the Amazon throughout its course, that we may suppose the atmospheric pressure in the interior is subject to changes not yet defined, and which defeat ordinary methods of observation. Wallace has observed that the variation of the barometer for three years at Pará was only three-tenths of an inch, and the mean height exactly 80 inches.



felt up to this point, and would be felt higher but for the narrows. Bates measured their rise and fall, 3 inches, 530 miles from the sea, on a little tributary of the Tapajos.*

The Amazon is not a continuous incline, but probably consists of long level stretches connected by short inclined plains of extremely little fall, sufficient, however, owing to its great depth, to give the gigantic volume of water a continuous impulse towards the ocean.†

As to the lower Amazon, it presents every evidence of having once been an ocean bay, the upper waters of which washed the cliffs near Obidos.‡

Only about 10 per cent. of the water discharged by the Amazon enters it below Obidos, very little of which is from the northern slope of the valley. The drainage area of the Amazon basin above Obidos is about 1,945,000 square miles, and below Obidos only about 423,000, or say 20 per cent., exclusive of the 354,000 square miles of the Tocantins valley.

The width of the mouth of the Amazon is usually measured from Cabo do Norte to Punto Patijoca, a distance of 207 statute miles, but this includes the ocean outlet, 40 miles wide, of the Pará river, which should be deducted, as this stream is only the lower reach of the Tocantins. If any portion of the waters of the Amazon finds its way round the southern side of the large island of Marajo into the river Pará, it is only through tortuous *caños* and broad natural canals, which are in no sense outflow channels of the Amazon.

The tides here are very capricious, depending on numerous and ever-changing factors, seldom following the regular law. When beyond the reach of local influences, spring tides are 14 feet and neap 10 feet. In certain localities, flood tides run from 6 to 10 miles an hour.

Following the coast, a little to the north of Cabo do Norte, and for 100 miles along its Guayana margin up the Amazon, is a belt of half-submerged islands and shallow sandbanks. Here, the tidal phenomenon

* Observations have shown with certainty that there is a difference of level between the Amazon at its mouth and the sea. In the rainy season, when the stream should be strongest, the flood tide has the greatest velocity for a distance of 140 miles up the river. Therefore, it may be concluded that the waters of the sea are always higher than those of the river when the flood stream is stronger than that of the ebb, or from December to April inclusive, and that the waters of the sea are lower than those of the river, or at least have the same level, when the ebb-stream is stronger than the flood, which is the case from June to October (see 'South American Pilot,' Admiralty).

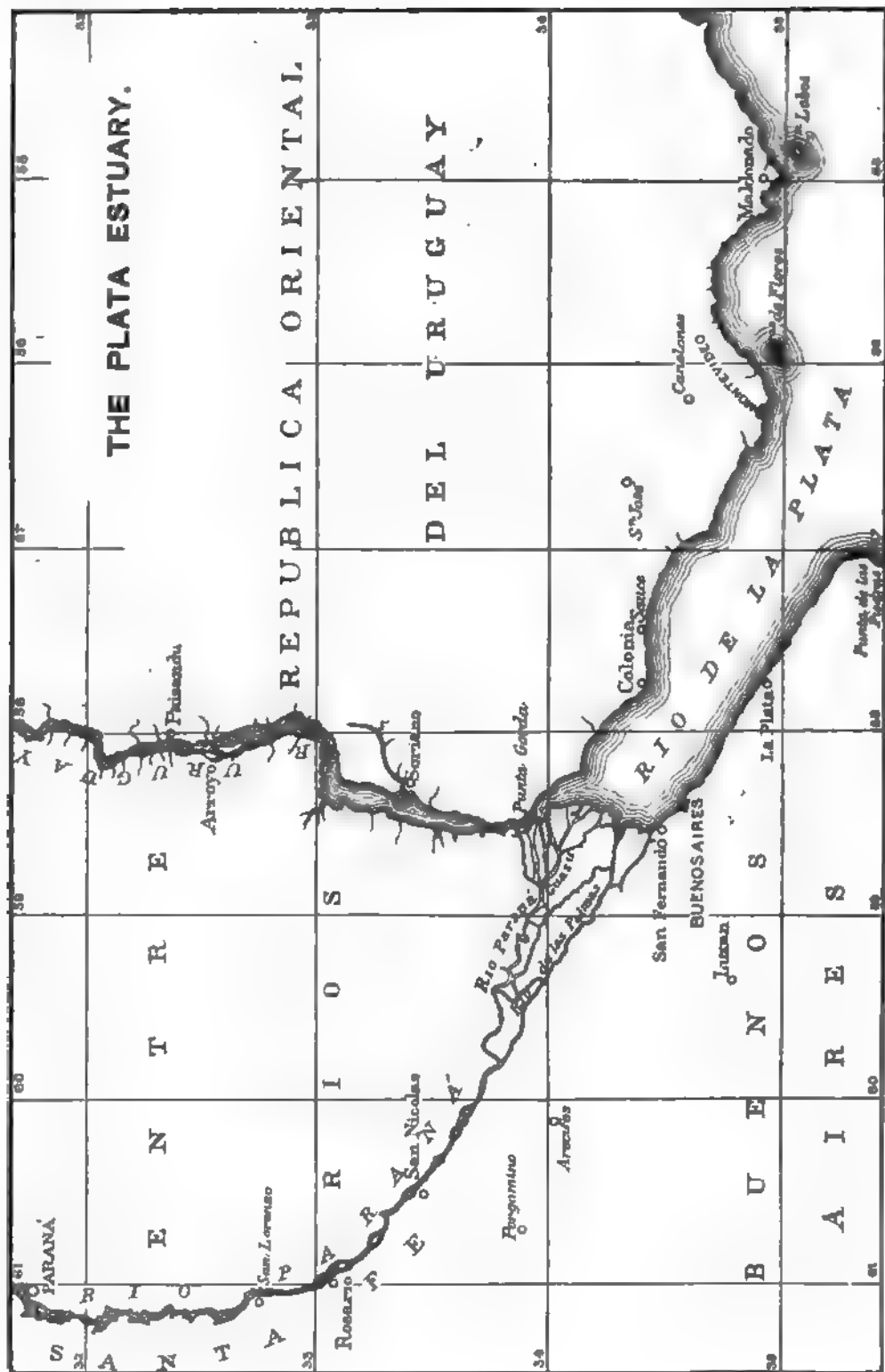
† It is the depth, not the slope of the bed, which principally governs the current of great rivers. The surface-current, as demonstrated by Révy, in his 'Hydraulics of Great Rivers,' is in proportion to the depth; that is, if it be 2 miles an hour where the water is 40 feet deep, it will be 4 miles where it is 80 feet deep, while the bottom current will increase in a greater ratio. Thus a very shallow river may require an incline of a foot to the mile to give it a flow of 3 or 4 miles an hour, while the Amazon, owing to its immense volume and great depth, may attain that velocity with a slope of less than a quarter of an inch per mile.

‡ See map of the Delta of the Amazon, p. 460.

called the bore, or *Pororoca*, occurs, where the soundings are not over 4 fathoms. It commences with a roar, constantly increasing, and advances at the rate of from 10 to 15 miles an hour, with a breaking wall of water from 5 to 12 feet high. Under such conditions of warfare between the ocean and the river it is not surprising that the former is rapidly eating away the coast, and that the vast volume of silt carried by the Amazon finds it impossible to build up a delta.

The Amazon is not so much a river as it is a gigantic, island-filled reservoir, extending from the sea to the base of the Andes; and, in the wet season, varying in width from 5 to 400 miles. Especial attention has been called to the fourteen main streams that discharge into it, but it receives a multitude of secondary rivers, which, in any other part of the world, would also be termed *great*.

Between eastern Brazil and the river Madeira, below its falls, the general slope of the country is inland, from east to west, and from British and Dutch Guayana to the Negro it is south-west. The lowering of Brazil in the direction indicated causes, in conjunction with the Andes, a depression in the heart of the continent, having an area of about 400,000 square miles. It is probably the bed of an ancient Amazonas lake, of such recent geologic age that for several months of the year a greater part of it is still under water. Roughly, its south-eastern boundary was the Madeira river, from the fall of Theotonio to the Amazon. Its north-eastern margin followed more or less the course of the Negro up to the mouth of the Uaupes. A line drawn thence to a point on the Ucayali, cut by lat. 7°, defines its north-western border. Its very irregular south-western shore extended in gulfs up the branches of the Purús and Juruá to the northern frontier of Bolivia. An arm of the lake, about 50 miles wide, pushed eastwards as far as Obidos, or perhaps further on to Santarem. This fresh-water *Amazonas sea* probably once received the outflow of the Mojos lake, which lay upon the level shelf of north-eastern Bolivia, at an elevation of 547 feet, across which several enormous rivers now find their way to the Madeira falls. They once flowed southward to the ancient Pampean sea, through the low gap which lies between the Andean *massif* and the Chiquitos sierras; but the rivers Grande and Parapiti, carrying huge volumes of alluvium from the Andes, threw a dam across this gap, and caused the formation of the Mojos lake, having an area of 115,000 square miles and a drainage basin of about 400,000. The Andes formed the western and south-western rim of the lake, and confined it, on the north, by low hills which they pushed down between the Purús and Mayutata rivers as far as the Madeira falls. The Matto Grosso highlands along the line of the Guaporé river were its eastern boundary, and the low Chiquitos sierras, overlooking the Gran Chaco, defined its south-eastern margin. When the Mojos lake reached the level of the lowest point of its northern barrier, the falls of the Madeira, it



commenced to send its surplus waters to the north; and, when the falls were sufficiently eroded to nearly drain it, the present river-system of north-east Bolivia was formed. The ferruginous conglomerate reefs of the falls are not yet sufficiently worn down to keep the Mojos basin constantly drained, for the lake still has an area of 35,000 square miles during four months of the year.

The ancient Pampean sea * extended inland from the present Plata estuary to the base of the Chiquitos sierras at about lat. 19°, and occupied the area between the Andes and the high land which lies immediately east of the Paraguay and lower Paraná rivers.

The existence of the great Amazonas sea, Mojos lake, and Pampean sea at a remote epoch, especially when the Andes were at a much lower elevation than at present, must have greatly affected the climate of central and western South America, and, by taking them into consideration, many vexed and difficult ethnological and other problems relating to the continent may be found of easier solution.

Whether the Amazon once flowed west into the Amazonas lake, and gradually ate its way back until it broke out to the east near Obidos and drained the great lake, or whether this emptied into the Orinoco through the Casiquiare canal, or whether the barriers which held it on the east and north were sufficiently high to allow it to connect on the south with the ancient Mojos lake and Pampean sea, can only be determined by the collection of much more data than explorers have thus far given of this immensely interesting region.

THE RIO DE LA PLATA, so-called, is the next great doorway to the continental interior. The drainage area of the Plata basin is over two and a half times that of the entire Pacific slope of the Andes. The most fertile, healthiest, and best part of Brazil lies within it, including the states of San Paulo, Paraná, Santa Catharina, and the greater part of Rio Grande do Sul, which can only boast that the eastern slope of their sea-coast range of mountains drains directly into the Atlantic, while the southern parts of Minas Geraes, Goyaz, and Matto Grosso contribute vast areas to the great basin, which also embraces the whole of Paraguay and south-eastern Bolivia, and part of the Argentine Republic.

The Rio de la Plata is a funnel-shaped estuary extending west-north-west from the sea about 170 miles.† Its extreme breadth at its mouth, is 138 miles, narrowing quickly at Montevideo to 57, and at its head, where it receives the Paraná and Uruguay rivers, its width is about 25 miles. The northern, or Uruguayan shore, is somewhat elevated and rocky, while the southern, or Buenos Ayrean one, is very low, and

* For my detailed description of the Pampean sea and Mojos lake, see the *Geographical Journal*, October, 1898.

† See map of the Plata Estuary, p. 386.

much of it has a *tosca* cap which gently dips under the river-bed. The whole estuary is very shallow, and in no place above Montevideo exceeds 36 feet in depth at low river. Its bottom generally consists of enormous level banks of sand, covered with from 10 to 20 feet of water. It offers a continuous and intricate channel of only about 22 feet depth, at average low river, to within about 14 miles of Buenos Ayres. This remaining distance has a depth of, at most, 18 feet in the uncertain channel. At times, however, the river is so low that for three or four days together carts can drive out a distance of 3 miles or more from the shore.*

The water-divide between the headwaters of the Madeira branch of the Amazon and those of the Paraguay river is, at the most, 817 feet elevation, and a part of it is formed by the low range of Chiquitos sierras lying between the Andean *massif* and Brazil. From these sierras, the country slopes very gently southward as far as the Bermejo river; thence for about 250 miles to the *rio* Salado it is nearly level, being the undisturbed bottom of the ancient Pampean sea; and thence, after a light swelling up, the country gradually slopes off to the Atlantic ocean south of the Plata estuary.

The portion of this region from the Chiquitos sierras to the Salado, much of it forested with hard woods, is called the Chaco. It is dry, arid, and sandy, especially its northern part from the foothills of the Andes to the vicinity of the rivers Paraguay and Paraná; but going south of the Salado the lands improve in quality, and gradually the Pampean formation gets richer and richer, until, spreading over the immense province of Buenos Ayres, it presents a bed of earth of great thickness and of almost matchless fertility.

The country lying west of the Sierra de Cordoba and the province of Buenos Ayres, is arid, sandy, and poorly watered, and in its northern portion there are saline areas of immense extent.

Paraguay and Uruguay I have already outlined. "Between the rivers Paraná and Uruguay, lies the Argentine Mesopotamia, the provinces of Corrientes and Entre Rios, covered with modern alluvium. The former is gently undulating, and is half submerged by lagoons, the largest, lying in the north, being the famous Ybará. The south and south-western part of Entre Rios is composed extensively of argillaceous earth, and the whole province is traversed by ridges of low hills, running nearly north and south, the main ones never exceeding an altitude of 650 feet." †

THE URUGUAY RIVER has a length of about 1000 miles. Many small

* "In the year 1795, the waters fell so much in a calm day that for 3 leagues out the shore was exposed, remaining so a whole day" (Azara, 'Historia del Paraguay').

"A severe north-west storm in 1792 altered for three days the course of the waters of the Plata, and left dry almost the whole upper part of this great river" (Lobo y Rudaveta, 'Manual de la Navegacion del Rio de la Plata').

† See 'Argentine Geography,' etc., *op. cit.*

streams from the western slope of the Serra do Mar unite in about lat. $27^{\circ} 45'$ to form the river Uruguay, which then, in imposing volume, flows west-north-west, forming the boundary-line between the Brazilian states of Santa Catharina and Rio Grande do Sul, as far as long. 52° W., near which it receives a considerable river from the north, called the Pepirí-guazú. Throughout this section it is enriched by many minor tributaries, mostly from the highlands which cross the state of Rio Grande do Sul. From the time it leaves the Atlantic coast range of Brazil, it runs for a long distance through a beautiful, open, hilly country until it enters thick forests which cover high hills.*

At the river Pepirí-guazú the Uruguay turns suddenly to the south-west, and continues this course to its junction with the Paraná. Near Fray Bentos, 61 miles before reaching the Plata, it flows into a great lake about 56 miles long and 4 to 6 wide, which is free from islands; but, above this lake, there are many large and small ones. At Punta Gorda, where the Uruguay debouches into the Plata, it is only 1 mile to $1\frac{1}{2}$ miles wide, but 90 feet deep.

From the Pepirí junction, the banks of the Uruguay are high and forest-covered as far down as about lat. $27^{\circ} 50'$, where the river is 2300 feet wide, and from 10 to 40 feet deep. Thence its course is through a smooth and generally open, but occasionally broken country; but along the lower 100 miles of its eastern side there are picturesque hills from 100 to 500 feet high, divided by many rivulets which fertilize rich valleys beyond; but the Entre Rios margin is low, monotonous, and wooded. Between lat. $27^{\circ} 58'$ and $33^{\circ} 24'$ it receives, from the east, three important tributaries, the Ipui-guazú, the Ibicui, and the Negro, the latter being the principal. A few rivers of minor importance enter it from the Argentine provinces of Misiones, Corrientes, and Entre Rios, the Guauguaychu being the largest.

The Pepirí-guazú was the limit between the possessions of Portugal and Spain. In its lower course it is about 250 feet wide, but it afterwards narrows to about 30 feet, and runs with great violence between high wooded banks. It is navigable by canoes for about 70 miles up from its mouth, as far as the Great Fall.

The Negro is the main tributary of the Uruguay, which it joins through a large delta of several islands. Its extreme headwaters are in the southern part of Rio Grande do Sul, but the main river belongs entirely to Uruguay, which it cuts midway from north-east to south-west. *En route* to the Uruguay river, it receives a number of copious affluents, and waters a most fertile and beautiful region. The lower reaches are navigable for craft of moderate draught.

The Uruguay is much obstructed by rocky barriers. Four miles below its confluence with the Pepirí-guazú it has a great cataract,

* Lobo y Rudavets, *op. cit.*

about 8 miles long, which rushes down a much-broken inclined plane with a total fall of 26 feet at low water. The river near the *Pepirí-guazú* is 1550 feet wide; but about $1\frac{1}{2}$ mile before reaching the cataract its width is reduced to 600 feet. Along the cataract it is closed in between high precipitous walls of black rock, only 70 feet apart.

Above Punta Gorda, 212 miles, is the *Salto Grande*, with a length of 15 miles of rapids, the greatest single fall being 12 feet, and the difference of level for the entire length of the reefs 25 feet. The reefs cross the river diagonally, and during floods, all but a length of $1\frac{1}{2}$ mile of them are submerged. Nine miles below the *Salto Grande*, is the *Salto Chico*, which bars navigation during six months of the year; but in flood-time it may be passed by craft drawing 5 feet of water.

The Uruguay can be navigated by vessels drawing $4\frac{1}{2}$ feet of water, at all seasons, as high up as the *Salto Chico*, lat. $31^{\circ} 21'$, and with a draught of 14 feet, as far as Paysandú for a greater part of the year. Fray Bentos may be reached all the year by any vessel that can ascend the Paraná.

Above the navigable lower river, and between the rapids, which are met from time to time, there is launch and canoe navigation for many hundreds of miles upon the main artery and its branches.

The Uruguay has its annual floods due to the rains in its upper basin. They commence at the end of July, and continue to November, attaining their maximum during September and October. At the narrow places it rises as high as 30 feet, but its average rise is 16 feet. It flows, almost throughout its course, over a rocky bed, mostly composed of red sandstone, which is at times very coarse, and then again of extremely fine composition. Except in floods, it is a clear-water stream, and, even at its highest level, carries but comparatively little silt.

THE PARANÁ.—The Rio Grande and Paranahyba unite to form the Paraná, the “Mother of the Sea” in Guarani. It drains a vast area of southern Brazil, and is about 1600 miles long from its extreme source in Goyaz to its junction with the Paraguay, and thence 600 more to the Plata estuary, its average width, for the latter length, being from one to three miles. The Grande is about 680 miles long, but it is only navigable in the stretches between the many reefs, falls, and rapids which interrupt its regular flow. It is formed from the union of many streams which descend from the slope of the Serra da Mantiqueira, in the region where the orographic system of Brazil culminates near the peak of Itatiaia-assu, almost in sight of Rio de Janeiro.

The main branch of the Paranahyba rises in about lat. $15^{\circ} 30'$ on the southern slopes of the Pyreneos mountains, and receives numerous tributaries before its confluence with the Grande, near which it is barred by two cataracts. It drains a little-known region of southern Goyaz and western Minas Geraes lying upon the southern watershed of Brazil.

Besides these rivers, the Paraná has many long and powerful affluents which enter it from the states of São Paulo and Paraná; but its western ones, limited in length by the Serra Cayapó and the highlands which border north-eastern Paraguay, are not of equal importance. Most of them, although obstructed by rapids, are navigable by launches and canoes. Among the eastern ones are the Tieté, the Paranapanema, formerly known as the Anemby, and the Iguazú. The first, over 700 miles long, rises in the Serra Paranapiacaba, and flows in a north-west direction. With the *rio Pardo*, it was the favourite route of the *Sertanistas*, explorers and raiders of Matto Grosso, although its course is broken by fifty-four rapids, and the lower river by two great falls, the Avanhandava, of 44 feet, and the Itapura, of 65 feet.

The Paranapanema is above 600 miles in length, and rises in a ramification of the Serra Paranapiacaba, which overlooks the Atlantic ocean. Its general course is north-west. From the south, it receives many important tributaries, but, from the north, its score of affluents have but little volume. It is navigable for a distance of about 30 miles above its mouth, and, throughout its course, it has many obstructions, which destroy its utility for commercial purposes.

The Iguazú, also called the *rio Grande de Curutiba*, has its headwaters on the slopes of the Serra do Mar, and flows nearly west through thick forests along the line of the 26th parallel of latitude. Its navigation is difficult even for small craft, as it is full of reefs, rapids, and falls. Its mouth is about 800 feet wide, and its middle depth about 40 feet. Sixteen miles above its mouth is the magnificent Salto de Iguazú, sometimes called the Victoria fall, round which canoes have to be transported 37 miles before quiet water is reached again. The volume of water which the Iguazú receives from its four principal affluents and a multitude of small streams is large, and as its combined flood tumbles 140 feet over the falls, into a wild gorge, the scene is of imposing grandeur.

The Paraná, at a point 28 miles above the mouth of the river Tieté, is interrupted by the falls of Urubuponga, but below these has unobstructed navigation for about 400 miles, as far down as the falls of Guaira (or Sete Quedas), about lat. $24^{\circ} 3'$, where the river gathers its waters into a great lake $4\frac{1}{2}$ miles long and $2\frac{1}{2}$ miles wide, preparatory to breaching the Sierra de Mbaracayú, which there disputes its right of way. With irresistible force, it has cut a deep gorge through the mountains for a length of about 2 miles, where, separated into several channels, it leaps along rapids and over cataracts, until it finally gathers its waters into a single volume, to plunge with frightful velocity through a long cañon only about 200 feet wide.

From the falls of Guaira, the Paraná, as far as its confluence with the Paraguay river, has carved its narrow bed through a red sandstone formation, along which it sometimes flows with much violence,

occasionally being interrupted by dangerous narrows and rapids, where the river-banks at times close in to a width of 450 to 600 feet, although its average is about 1200 to 1600 feet. At the south-east angle of the state of Paraguay, it is prevented from continuing its southern course to the river Uruguay by the highlands which cross the Argentine province of Misiones, and connect those of Rio Grande do Sul with the Caa-guazú range of Paraguay. Here, therefore, it is turned westward; but, before escaping from its great sandstone bed, it is obstructed by several reefs, notably at the rapids of Apipé, which are the last before it joins the placid Paraguay, 130 miles further on, to thenceforth flow without interruption to the sea. From the Apipé rapids, there is a great triangular space at the south-west corner of the state of Paraguay, but little above sea-level, consisting of low, sandy ground and morasses, at times flooded by the Paraguay river. This district, united to the equally enormous one occupied by the Yberá lagoon and its vast surrounding morasses, in the northern part of the Argentine province of Corrientes, was probably the delta of the Paraná river when it emptied into the ancient Pampean sea. The Paraná is charged with but little silt in comparison to its much smaller affluent, the Paraguay; but in flood it carries a volume of water estimated to be ten times that of the latter stream, and its width along the northern sandstone border of the province of Corrientes is from 3 to 9 miles.

THE RIVER PARAGUAY, the main affluent of the Paraná, rises in Matto Grosso, in the vicinity of the town of Diamantino, about lat. $14^{\circ} 24'$. It flows south-west, as far as Villa Maria, along the foot of the high plateau which divides it from the Cuyabá river to the east; and then, turning southward, soon reaches the morass-lake of Xarayes, which it traverses for about 100 miles until its junction with the *rio São Lourenço*. A few miles below Villa Maria, it has an affluent from the north-west, the Jaurú, which has its source nearly in contact with the headwaters of the Guaporé branch of the river Madeira. The Cuyabá river, which is called the *São Lourenço* for 90 miles above its junction with the Paraguay, has its sources in lat. $13^{\circ} 45'$, almost in touch with those of the Tapajos. The Cuyabá crosses near them from north-east to south-west for a distance of 150 miles, and is only separated from them by the narrow plateau-ridge of Trombador, which, at places, is not 3 miles wide. As the Cuyabá flows onward, it is enlarged by a number of minor streams, especially from the north-west, until it reaches the spur of the great sandstone plateau, at the south-eastern point of which the town of Cuyabá is situated; thence it enters the upper margin of the vast, swampy and inundated region between the Paraguay and *São Lourenço*. Just below the point where it takes this latter name, it is 700 feet wide. Above the town of Cuyabá, the river is from 150 to 400 feet wide, and may be navigated up stream for 150 miles by canoes, but there are many rapids. The town may be reached from the Paraguay at low

water, by craft drawing 18 inches. According to the numerous observations of Clauss, Cuyabá is only 660 feet above the sea. Thus, again, we see how slight is the elevation of the interior of South America.

From the junction of the São Lourenço (or Cuyabá) with the Paraguay, the latter, now a great river, moves sluggishly southward, spreading its waters in the rainy season for hundreds of miles to the right and left, as far south as lat. 20° , and turning vast swamps into great lakes, like that of Mandiore on the Bolivian side; in fact, temporarily restoring the region for thousands of square miles to its former lacustrine condition.

The first river of importance entering the Paraguay from the east (about lat. 19°) below the Cuyabá is the Taquary, which rises in the Serra Cayapó on the southern extension of the Matto Grosso tableland. It is a river famous in the history of the slave-raiders from São Paulo in the sixteenth century. I shall have occasion to describe the route they followed when I treat of the commerce of the country. South of this stream about 50 miles, a considerable river, the Mondego, with many branches, draining a great area of extreme southern Matto Grosso, also flows into the Paraguay; and still further south, near lat. 21° , is its very straight tributary, the Apa, which is the boundary-line between Paraguay and Matto Grosso. From northern to southern Paraguay, the western drainage slope of the country has numerous short streams which swell the parent river.

THE PILCOMAYO.—From the west, the Paraguay has but few and very short tributaries until it receives the Pilcomayo, the country being too flat and the soil too sandy and thirsty to allow any large amount of water to reach the great river. The Pilcomayo is of more importance as regards its length than its volume. It rises in the Andean *massif* north of Mount Potosi. It races down the mountains to their base, and then crosses the Chaco plains to join the Paraguay nearly in front of the city of Asuncion. It receives no branch of importance until it reaches about lat. 21° , where it is joined, from the south-west, by the river Pelaya, upon which Tupiza, the most southern city of Bolivia, is situated. The Pelaya rises upon the lofty inter-Andean plateau, and, taking an eastern course, saws its way across the inland Andean range, turns north and then east to unite with the Pilcomayo, which it is said to, at least, equal in volume. Just below the junction is the fall of Guarapetendi, 23 feet high. From this point to the mouth of the Pilcomayo the distance in a straight line is 480 miles, although by the curves of the river, which is extremely tortuous, it is about double that distance. According to Storm, who quotes Captain Baldrich, the river bifurcates, at lat. $21^{\circ} 51'$, to again become a single stream at lat. $23^{\circ} 43'$, the right channel being the greatest in volume. It is probable that, between 23° and 24° south, it throws east-south-east three great arms to the river Paraguay, the upper portions of which have yet to be explored, but the

lower parts have been examined, for 100 to 200 miles, up from the Paraguay. Enumerating from north to south, they are called the Esperanza, the Montelindo, and the Macá. From 180 to 200 miles above its mouth, the Pilcomayo filters through a vast swamp about 100 miles in diameter, through which there is no principal channel. This swamp, or perhaps shallow lagoon, is probably partly drained by the river Confuso, which reaches the Paraguay between the Pilcomayo and Masá. A northern branch of the Pilcomayo, the Fontana, the junction being at $24^{\circ} 56'$ lat., is probably also a drainage outlet of the same great swamp. For the first 100 miles below the fall of Guarapetendi, the Pilcomayo is from 600 to 1000 feet wide, but it so distributes its waters throughout its many bifurcations, and loses so much from infiltration and in swamps, and by evaporation from the numerous lagoons it forms on either side of its course, that its channel is greatly contracted before it reaches the Paraguay. It is possible that its Montelindo outlet may be the main river. From Sucre to the Andean margin of the Chaco, a distance of about 350 miles by the river, the fall is, at least, 8000 feet; a sufficient indication that any navigable parts of the stream must frequently give place to torrents and rapids, making its upper course useless for purposes of navigation. The statements made by explorers regarding the Pilcomayo are very confused. This is probably due to the wandering propensities of the river, and the immense areas of country it overflows in flood time. The missionaries, in 1556, first reported the existence of the Pilcomayo, which, for a long period of time, was known as the Araguay. The first definite information regarding its course was given by the expedition of Armenta y Zarate, which descended its valley, by land, for a considerable distance in 1672. In 1721, Patiño and Rodriguez partially explored it, and, since then, numerous attempts have been made, by various explorers, to test its navigability, all of which have been failures; and several of them have ended in disaster and loss of life, so that the Pilcomayo now has a sinister reputation.

THE BERMEJO RIVER parallels the Pilcomayo, and enters the Paraguay a few miles above the junction of this with the Paraná. Its numerous sources are on the eastern frontage of the inland Andes, between the Bolivian town of Tarija and the Argentine city of Jujuy. Its most northern tributary is the San Lorenzo, which, after being augmented by several small streams, takes the name of Rio de Tarija. This, running east, is, in turn, swollen by several affluents, and then, taking a general south-east course, joins the Bermejo, in lat. $22^{\circ} 50'$, at a point called the Juntas de San Antonio. Thence, flowing southward, the Bermejo is enriched by many tributaries from the Andean gorges, and, finally, at lat. $23^{\circ} 50'$, receives its main affluent, the San Francisco, from the south-west. The latter has its source in about $22^{\circ} 30'$ lat., and, under the name of *rio Grande*, runs directly south,

in a deep mountain valley, as far as Jujuy. It then turns east for 50 miles, where it is joined by the Lavayen, from the south-west. These two streams form the San Francisco, which from their junction, runs north-east to the Bermejo. The average width of the San Francisco is about 400 feet. It is seldom over two feet deep, and has many shoals and sandbanks. From its junction with the latter stream, the Bermejo flows south-east to the Paraguay, with an average width, in its main channel, of about 650 feet, although narrowing at times to 160 and even 100. In its course, however, it bifurcates and ramifies into many channels, forming enormous islands, and frequently leaves old beds for new ones. During floods, it inundates immense areas of the flat Chaco country, filling vast lagoons and swamps on both sides of the river, which, at such times, becomes of indefinite width. Since the exploration of it by Patiño, in 1721, it has often been examined from its sources to its mouth, with a view to ascertain its value for commercial purposes. Captain Page, in 1854 and 1859, found it impracticable to ascend it over 135 miles in the dry season, with a little steam-craft drawing but 23 inches of water; but, in 1871, when the floods commenced in December, he succeeded, in 60 days, in reaching a point 720 miles from its mouth in the steamer *Alpha*, 53 feet long and drawing 30 inches of water. He afterwards penetrated another 100 miles up-stream. The round voyage took a year, the progress made being very slow, owing to the swift currents, shoals, quicksands, fallen trees, and snags.

THE SALADO, about 250 miles south-west of, and approximately parallel to, the Bermejo, is the first great tributary which the Paraná receives from the west below its junction with the Paraguay. Its extreme headwaters are in the Argentine province of Salta, and they drain a much-broken Andean region lying between 24° and $26^{\circ} 30'$ lat. The most western sources are the rivers Santa Maria and Calchaquí, which unite near the town of San Carlos and form the river Guáchipas, which flows north-east until it meets the Arias, which has collected in a single channel various small affluents from the north and west. Having received the Arias, the Guáchipas runs north-east about 50 miles, where it changes its name to the Juramento, which is retained until the river reaches the Chaco plains, at the base of the foothills of the Andes. Here it becomes the Salado, a name it preserves for the remainder of its course. It joins the Paraná near Santa Fé, lat. $31^{\circ} 39'$, and long. $60^{\circ} 40'$ W. From the time the Salado leaves the foothills, it lazily rambles across the plains, in a south-east course, now in a single channel, then bifurcating into several branches and forming long islands, and again flooding to the right and left into great lagoons and swamps, sometimes to a width of 60 miles. In the dry season, it is a narrow, crooked stream, full of shoals and snags. At all times it carries an immense quantity of floating vegetation and trunks of trees, which constantly fall from its crumbling banks. Explorers of the

river, inclusive of Captain Page, in 1855, claim that its lower half is navigable. This may be true, but the many efforts which have been made to utilize it for commerce have been failures. The Salado occupies the south-west side of a very level depression 250 miles across from south-west to north-east, and only 240 feet above the sea. Along the north-east side of this depression runs the Bermejo.

As the Pilcomayo, Bermejo, and Salado wander about the country, ever in search of new channels, they constantly erode and tear away great quantities of the Pampean material, dissolve it into silt, and pour it into the Paraguay and Paraná. Pelleschi estimates that "the soil annually subtracted from the territory of the Chaco, by the Bermejo alone, equals 6,400,000 cubic yards."

South of the Salado, the rivers Saladillo, Primero, and Segundo provide the water for the evaporation from the great inland lake of Porongos. The Tercero and Quarto streams unite and empty into the Paraná near Rosario with a considerable volume of water. The Quinto, with other small rivers, draining the southern spurs of the Cordova range, are absorbed by the thirsty Pampean swamp, La Amarga.

From Paraguay south, the eastern side of the Paraná shows a series of sandstone bluffs for 30 miles, and thence, for 240 miles, the inland borders sometimes rise to a height of 80 feet, and then, at Goya, descend almost to the river-level. Near the boundary-line between Corrientes and Entre Rios, the banks are very low on both sides of the river, and continue so for nearly 100 miles; but onward for 150 miles, the left bank is margined as far as Diamante by a range of hills from 125 to 160 feet high, at times boldly escarped. At Diamante, the hills trend inland south-east for about 50 miles. They probably once formed the border of an ancient channel of the river. From lat. $31^{\circ} 30'$ to the head of the Plata estuary, the western bank of the Paraná is a precipitous bluff of reddish clay, varying from 25 to 75 feet above mean river-level. It is being gradually undermined, and tumbles into the water in great blocks, to add to the immense volume of silt which the river carries. "The lowest level of the Paraná is in October and November, and, save an occasional freshet, it remains stationary until the beginning of summer, when its waters begin to rise, reaching their maximum about the middle of February in the lower part of their course." *

The difference between low and high river is generally about 12 feet, depending upon the varying quantity of rains in Brazil and the melting of the Andean snows. The current of the Paraná averages, from its junction with the Paraguay, about $2\frac{1}{2}$ miles per hour, and the river varies at low water from 1 to 3 miles in width; but, in floods, it seems almost a continuous lake, broadening from 10 to 30 miles, and burying

* 'El Territorio de las Misiones,' por Ramon Lista.

many of its numerous islands and marginal swamps in a vast sheet of water, obliterating its many parallel lateral channels and intricate systems of connecting canals. In the middle Paraná, from the mouth of the Iguazú to the mouth of the Paraguay river, there are many islands, some of them large, rocky, and high above the river. Islands are numerous from the mouth of the Paraguay to the city of Rosario, some of them of great area, and, again, below this point, they soon increase in number and size until the Plata river is reached. They are mostly covered with dense and beautiful vegetation, which, in the lower river, is dark green mingled with bright crimson foliage of the seibo tree. The upper portions of the trees, being out of water in flood times, appear like floating forests. Then the river often makes wild work with its banks, and builds up or sweeps away entire islands, leaving deep channels in place of the latter. Mouchez, in 1857, searching for two islands, the position of which he had fixed the previous year, found, in the place they had occupied, a depth of 25 and 32 feet of water.* The estuary of the Plata must have extended, in a very recent geological period, inland from its present head to at least lat. 32° ; but the enormous amount of silt which the Paraná receives from its Paraguay affluent and from the tributaries which reach it from the Andes, has filled the lower length of about 220 miles with these muddy islands resting on a sandy bed of great depth. The frontage of the Paraná delta is 40 miles across, almost in a straight line from north to south. Through this, the river finds its way to the Plata by eleven outlets, large and small. The marked regularity of the frontage is due to the current of the Uruguay river cutting across its face and carrying the silt to the south-west, until it meets the outflow of the Paraná de las Palmas, which sweeps it south-east along the Buenos Ayrean shore.

The Paraná has been struggling, probably for many centuries, to extend its delta further into the Plata estuary, but has been defeated by the river Uruguay. The contour lines of the bottom, at the head of the estuary, show, however, that the Paraná has been gaining ground, and has outlined the base of a great island, which it is gradually building up, and which must ultimately emerge from the water, leaving the Paraná Guazú between it and the Uruguay shore. When this has been effected, the lower Uruguay will be turned to the south-east, and no longer impede the rapid extension of the Paraná delta over the vast, flat area of the Rio de la Plata.†

The mean flow of the Mississippi river at New Orleans is 675,000 cubic feet per second, and its flood maximum about 1,000,000. The

* The lower delta of the Paraná does not share in these phenomena; its islands and main channels appear more fixed. This probably is due to the less elevation attained by the waters, and the numerous branches which distribute them into the Plata estuary.

† See map of the Delta of the Rio Paraná, p. 460.

minimum of the Plata, past Buenos Ayres, is 534,000 cubic feet per second, the maximum 2,145,000. It may therefore be fairly assumed that the yearly discharge of the great North American river is not superior, and may be inferior, to that of the Plata.

The Paraná is navigable at all times as far up as the São Lourenço river by craft drawing 3 feet of water, and to within a few miles of Asuncion, the capital of Paraguay, by vessels drawing 9 feet. The city of Paraná may be reached with a draft of 12 feet, and Rosario with 15 feet of water.

Communication by land between southern Matto Grosso, northern Paraguay, and the eastern Andean slopes of Bolivia is extremely difficult. The distance over a level road from Curumbá (lat. 19° , long. $57^{\circ} 45'$ W.), on the Paraguay river, to Santa Cruz de la Sierra is 570 miles. In the dry season the country is as wanting in water as it is overflowing in the wet months, and beasts of burden frequently die of thirst, or are drowned in the effort to cross it.

Under Spanish rule, the Government of Paraguay, at an early date, was especially charged to open a route to Perú across the Chaco. Flores, one of the commissioners, in 1756, complained to the Marques de Valdeiros that the archives of Asuncion contained nothing upon the subject, nor even the memory of the road which, in previous times, was used by the inhabitants of Perú and Paraguay. He characterized the western bank of the river Paraguay as "an interminable gulf of land." We shall hereafter find that the difficulty of transit of this Chaco area had a salient influence upon the commercial development of colonial South America.

To the west, the Plata basin is walled in from the Pacific ocean by the Cordillera of the Andes; to the east, are the mountains of Brazil, and a gigantic river system too formidable to bridge with profit; to the north lies the heart of the continent and the vast counterforts of the inland Andes; to the south is a facile exit to the Atlantic, through the Rio de la Plata. At the head of this estuary, the principal terrestrial as well as all of the fluvial trade routes concentrate. They traverse a land teeming with resources, and give life, vigour, and prosperity to an emporium which is rapidly becoming one of the greatest in the world.

BAHIA BLANCA * is the *fourth doorway*, and the natural commercial outlet of an area of country greater than the valley of the Orinoco.

As lat. 30° is passed, going southward, the eastern slope of the Cordillera of the Andes begins to receive a sufficiently increased rainfall to supply the waters for the western system of Argentine rivers which try to find their way to the river Colorado, but which they only reach at rare intervals when some exceptionally heavy storm aids their effort to satiate the sandy desert which they traverse. One of these streams,

* See map of the Estuary and Port of Bahia Blanca, p. 399.

the Vinchina, rises as far north as lat. $27^{\circ} 30'$ in the Argentine province of La Rioja, and unites with the Guadacol, from the west, to form the Bermejo, which, after a southern course through the province of San Juan, is lost in a great swamp, in lat. 32° , which finally drains into the river San Juan. At about 31° , it has a branch from the north-west formed by the union of many streams from the Andean valleys. The San Juan represents the drainage from the gorges of the Cordillera lying between $30^{\circ} 30'$ lat. and $32^{\circ} 30'$, which, at Calingasta, concentrates into a single channel and runs south-east to the lagoons of Huanacache, which, swollen also by the waters of the Bermejo, finds an outlet into the river Desaguadero, running directly south towards the Colorado. *En route*, the Desaguadero has no tributary from the east, but from the west it receives the Tumunyan, the Diamante, and the Atuel, all of them long streams, into which pour numerous water-courses which violently descend the Andes. The Desaguadero, under different names, finds its way into the great swampy lagoon near 38° of latitude, known as the Urre Lauquen. In their long course through a desert district, where the evaporation is immense and the land insatiably thirsty, the great volume of water which the rivers of this basin collect and send southward only reaches the Urre Lauquen as a feeble stream. It formerly joined the Colorado by a channel yet visible, and, it is said, still used in exceptional floods. Thus the Colorado is cut off from the greater part of its natural basin by a region which is apparently growing drier and more arid, and the river is now dependent for its flow upon its head branches, the Grande and Barrancas, streams which collect the drainage of many inter-Andean valleys, and use the Colorado simply as a canal to send it south-east to the sea. This canal receives no tributary in its long course from the foothills of the Cordillera. In the rainy season, it is a quarter of a mile wide, but, in the dry one, shrinks until it is easily fordable. The rivers of the entire Colorado basin are useless as commercial avenues. The contour-lines around the lower Colorado indicate that the river once emptied into a broad, shallow estuary which penetrated inland from the present coast-line about 116 miles. It probably included the present Bahia Blanca and its northern coast as far as Mount Hermoso.

Bahia Blanca is the natural emporium for all this inter-Andean region. It also seems destined to control the export and import trade of at least one-half of the fertile province of Buenos Ayres and of the whole of the valley of the Negro, the upper portion of which is a region of great agricultural and pastoral possibilities. The distance to the sea from the central city of Cordova is the same through Bahia Blanca as it is through Buenos Ayres and the Plata estuary, while Bahia Blanca, so easily accessible from the ocean, is the deepest and best harbour between Brazil and Patagonia. Evidently, therefore, this fourth doorway to the interior of the continent has an important future.

PATAGONIA.—Palæontological discoveries in Patagonia appear to confirm the contention of some scientists that South America is but the outlying remnant of a vast antarctic continent, of which South Africa, Australia, and New Zealand formed a part. It is claimed that they share certain of their fauna in common. A striking example is the discovery recently made by one of Dr. Moreno's assistants (Mr. Roth, of the Plata Museum), who, in 1897, found in the upper Cretaceous beds of Patagonia, near Lake Musters, a caudal sheath-ring, very similar to that of the great Pampean glyptodon, but which Dr. Moreno refers to a form like the Pleistocene Chelonia, called the *Miolania*, from Queensland and the Lord Howe islands. Very recently Mr. Roth has found other portions of the same animal, including its complete skull. These original remains are so astonishingly like those from Queensland, at the British Museum, that their close alliance is evident, and any difference apparently only specific. Taking into consideration the incalculable lapse of time which separates the Australian Pleistocene specimen from the Patagonian Cretaceous one, the form has been maintained with remarkable persistency. If experts confirm Dr. Moreno's opinion that the two skulls belong to the same genus, it will go far to prove the theory that South America and Australia were once connected by land.*

Until the great expedition of Fitzroy and Darwin attracted the attention of the world to Patagonia in 1832, its interior was a geographic mystery, the one ray of light being the voyage of Viedma up the Santa Cruz river to Lake Viedma in 1782. Even the description of the *rio Negro* by Padre Falkner, published in 1775, was based on *data* derived from the Indians, and from information given by the Chilian missionaries who had penetrated to its headwaters from the Pacific side of the continent. But, in 1869 and 1870, the voyage of Captain Musters through the heart of Patagonia awoke the dormant spirit of exploration, and, in 1873, both the Chilian and Argentine Governments organized expeditions to examine the *terra incognita*; the former sent Captain Simpson from the Pacific side, and the latter Dr. Moreno from the Atlantic. Since then, the interior has been extensively explored, the western slope by Chilian scientists, notably by Dr. Steffen, and the eastern by Argentine ones, especially Dr. Moreno. They have greatly enriched our previously meagre knowledge of the country.

Patagonia extends from the *rio Negro* to the Straits of Magellan on the Atlantic side, but, on the Pacific coast, it commences only at about 41° 30' lat., where the central valley of Chile is submerged by the channels which wash the base of the Andes. The physical characteristics of the two sides have a marked contrast except near the summits of the

* Dr. H. O. Forbes, in his lecture before the Royal Geographical Society on the Chatham islands, roughly outlined the supposed ancient antarctic continental area. See Supplementary Papers, 1893.

Cordillera. The lands immediately south of the Negro are very similar to those lying between it and the Colorado and the inter-Andean district south of Mendoza. Between Bahia Blanca and the Negro on the Atlantic border, tertiary rocks commence to appear covered by extensive sand-dunes. A bed of sand and clay covers the soil, and, advancing south, the Patagonian shingle formation appears. Just south of the mouth of the river Negro, commences an immense belt of grey and yellow tertiary cliffs from 120 to 300 feet high, which continue to border the Atlantic coast as far south as the Straits of Magellan. These tertiary layers extend inland, gradually rising to the foot of the ridges which precede the Cordillera of the Andes.

The powerfully eroded longitudinal section of the Andes contains immense valleys frequently holding lakes of an Alpine character, some of which reach even to the western border of the tableland. Many of these, even though lying to the east of the Cordillera, find their outlet to the Pacific ocean through deep gaps of the mountains, while others send their waters through transverse depressions to the Atlantic. It is notable that where a large lake or a group of small lakes exists on the eastern slope of the Andes, transverse depressions are also found, which, in former times, were their drainage channels to the east. When, in a recent geologic period, rivers running west through the Andean gaps have captured any lakes, the valleys which these once occupied are dry, and contain only a stream or river of minor importance.

Following up the most northern of these depressions, north-west from the Atlantic, we find it developed between low cliffs which border the tableland. It is occupied by the *rio* Negro, which is formed by the junction of the rivers Neuquen and Limay, near long. 68° W. The former descends from the north-west, draining a rough and much broken country with many small existing lakes and the remains of many great ones which once watered extensive regions which are now barren. The river Limay, from the south-west, has its headwaters among the Patagonian Alps, the magnificent scenery of which is singularly wild and attractive. Ascending the river, and crossing its gorges and barren lands, the country becomes more and more broken, and the plateau is covered with basaltic lavas and granitic masses. At length the Collon-Cura, the principal affluent of the Limay, is reached. In common with the Bio-bio, it drains a vast lacustrine depression, the Collon-Cura taking the southern remains of the former great lake, and the Bio-bio the northern, intersecting the Cordillera and emptying into the Pacific. To the west of the Collon-Cura are a number of small lakes of great beauty. In lat. 41° we reach Lake Nahuel-Huapi, with its tributary lakes Correntoso and Espejo, a group of almost matchless magnificence. Lake Nahuel-Huapi is 207 square miles in area, and flows into the river Limay. Surrounded by large forests, it extends, in several deep fjords, into the very ridge of the Cordillera, while in contact

with it, to the south-west, is the gigantic Mount Tronador, with an immense glacier descending from basaltic cliffs. The wondrous beauty of this very extensive lake region is in bold contrast to that lying between the river Limay and the Atlantic ocean, and bounded on the north by the *rio Negro*; for, on this tableland, we find hollows containing salt deposits and ancient west-to-east channels of lost rivers, and here and there a small hill but no important stream. These dreary, barren lands, called the Huincul-Mapu, consist of shingle, with a little coarse grass and a few shrubs. To the south, is a low group of highlands, which seem to be a reappearance of the Argentine Cordoba range. The plateau from which they rise is capped by the black lava which renders so large a part of central Patagonia of little value.

Padre Falkner's work upon Patagonia led to the exploration of the *rio Negro* by Villarino, under orders from the Spanish Government. In 1782, he ascended it with four well-equipped launches. With immense difficulties from the very start, he succeeded in reaching a point at its headwaters 525 miles from the sea by the curves of the river, the result being a practical demonstration that it is of very little use for commercial purposes.

Between the Negro and the Chubut can be traced a great transverse depression, now dry, from the bay of San Antonio to the lake Nahuel-Huapi, through which the lacustrine system of North-Western Patagonia probably once drained to the Atlantic. The Chubut runs in an apparently eroded valley eastward from the Andes, among the foothills of which rise the rivers Maiten and Tecka, which unite to form it. The entire region traversed by it is barren and useless. It is a rapid, crooked stream of irregular depth, and carries but little water.* Its lower course, at its mouth, is only about 130 feet wide, and admits vessels drawing 7 feet of water, which can penetrate but a few miles inland. Above its mouth, the river runs through a valley which opens to a width of 6 or 7 miles for a length of 45 miles. It is margined by cliffs about 300 feet high, which are at times escarped and then again of easy slope from the edge of the barren tableland. This is the fertile valley of the Welsh settlers, which, however, yields its products only to irrigation.

The Andean slopes, south of the river Tecka as far as 46° of latitude, are drained by a number of streams which flow into and form lakes Colhue and Musters, which drain north-east into the Chubut, and which are the remains of a former lake of much greater extension. The principal of the above streams, the Senguerr, runs across the eroded tableland extending between the hills of Tepuel and Omckel and the most eastern Andean mountains. In these tablelands, which are from 2300 to 3000 feet in height, is the continental *divortium aquarum* to the

* See 'Viaje à la Patagonia Austral,' por F. P. Moreno.

east of the Cordillera of the Andes. The northern part of the district is drained through a break in the mountains to the Pacific ocean by the river Fataleufu, and the central part drains westward through the Cordillera to the rivers Palena and Cisne. South of the Chubut, as far as the parallel of lakes Colhue and Musters, the country, from the coast to the foot of the Andes, is a vast shingle-covered plateau, with table-hills and ravines, the beds of extinct rivers, barren cliffs, and immense extensions of black lava.

South of the river Cisne is a group of mountains holding lakes La Plata and Fontana; and, south of these, a transverse depression extending from the Pacific to the Atlantic, the eastern part draining to the latter ocean, and the western to the former through the river Aisen and its affluents.

Lake Buenos Ayres, the largest in Patagonia, is 712 feet elevation, and lies between lat. 46° and 47° . In very recent times, it sent its waters to the east, but they are now diverted to the west through another great interoceanic depression. Towards the Atlantic it was drained by the now unimportant river Deseado, which enters the sea at Port Desire. Its Pacific outlet is by the river Las Heras, which also drains lakes Soler, Brown, and Pueyrredon into the immense fjord, at lat. 48° , called Calen inlet. The Las Heras is a violent stream with many rapids and obstructions.

South of the Deseado, there is no river of importance until the Santa Cruz is reached, although the intervening plateau is carved with hollows and gorges. The tops of the existing table hills are generally capped with lavas.

There is another group of lakes called Volcan, Belgrano, Azara, and Nansen, the surplus waters of which once flowed eastward to the Atlantic, but now have their outlet into the northern arm of the *rio* Mayer, which has been diverted to the west, and winds through the mountains to empty into the large lake San Martin, which, in turn, finds an outlet across the Cordillera into Calen inlet by the river Toro.*

The *rio* Chico branch of the Santa Cruz, which rises between great lava-streams near Lake Quiroga, was once an important stream, but is now of shrunken proportions, and its wide valley is filled with detritus and enormous erratic boulders. A short distance above its mouth is the almost lost river Shehuen, which has excavated a deep bed in the basaltic lava and runs east from the vicinity of lakes Viedma and San Martin, both of which it once drained. The large area of country lying between the Chico and the Shehuen is the most mournful of Patagonia, and is covered almost totally by basaltic lavas.

The great, deep lakes Viedma and Argentino lie, the one to the north, and the other to the south of lat. 50° ; they find an outlet to

* See "Explorations in Patagonia," *Geographical Journal*, 1899, by Dr. Moreno.

the Atlantic by the tortuous and reef-obstructed river Santa Cruz to Port Santa Cruz. The river is navigable for light craft during flood time. To Gardner, in 1867, fell the good fortune of discovering the beautiful lake Argentino, afterwards so named by Moreno; and Thomas Rogers, of the Chilian navy, while engaged in his valuable explorations of the south-west coast of Patagonia, also penetrated to it across the Andes.

The only river of any importance between the Santa Cruz and the Straits of Magellan is the Gallegos. It is a short stream, of no value for navigation, and flows from its sources, of little elevation, through a country covered with basaltic lava and shingle.* Ramon Lista† gives an interesting description of the country lying between the Santa Cruz river and the Straits of Magellan, much of which is adapted to pastoral purposes. Aside from the region of the north-western lakes, it is probably the most promising part of Patagonia for settlement.

The great antarctic Humboldt current finds its way northward along the west coast of Patagonia, while on the Atlantic side the equatorial current sets southwards, so heated that, on any parallel of latitude between the Plata river and the Straits of Magellan, it is six degrees warmer on the Atlantic side of the continent than it is on the western side. In consequence, the colder atmosphere of the Pacific coast rushes eastward, increasingly congealed, through the wide glacier-filled valleys of the low Patagonian Cordillera, to fill the vacuum created by the heated belt on the eastern slope of the mountains. The result is an abundant rainfall, and that long series of lakes, thirty to forty in number, nearly all of which lie along or near to the 72° of west longitude. These not only collect the storm waters, but the flow from the glaciers and melting snows.

THE STRAITS OF MAGELLAN, which have played such a prominent rôle in the commercial history of South America, are 240 miles long from entrance to exit, in a straight line, and 310 miles measured by their windings. The tides at the Atlantic end rise from 36 to 44 feet, and at the Pacific only 4 feet. Such a difference occasions great perturbations in the currents, which, through the narrows, run from 5 to 8 knots an hour. Along the eastern 100 miles, as far as Cape Negro, the land is low and treeless, but the country further on gradually swells into highlands, until at Cape Froward it becomes mountainous and thickly forested, remaining so to within 100 miles of the western entrance of the straits. For this last stretch, however, the forests gradually merge into scrubby bushes, which finally disappear, leaving the rocky hills and mountains bare of vegetation except deep beds of saturated moss and a few stunted bushes, which cover their lowest slopes or fill their ravines and gorges.

* See 'Patagonia Austral,' por Carlos M. Moyano.

† 'Mis Esploraciones y Descubrimientos en La Patagonia, 1877-1880.'

Cape Froward, in lat. $53^{\circ} 34'$ and long. $71^{\circ} 18' W.$, is the extreme southern point of the continental land, and is about midway of the straits. To the eastward of this cape, it is possible to tame down the country to the use of man; but, west of it, there is nothing but savage hills and mountains, from the slopes of which glaciers descend almost to the sea.

The Pacific ocean seems to have selected the western half of the Straits of Magellan as the focus of its most furious and enduring gales. They whirl through it almost incessantly, and, with violent squalls and driving rain and snow, add their contingent to the many other obstacles which beset every sailing ship which ventures the transit from east to west.

An archipelago is separated from Patagonia by this mighty rent in the Andes. The largest of its many islands is Tierra del Fuego, having an area of 20,000 square miles. It presents an unbroken Atlantic coast-line to its south-eastern terminus, at the Strait of Le Maire. The island is similar in character to the hilly, mountainous country of south-western Patagonia, and its southern part has a range of wooded mountains and highlands descending north and east into hilly and rolling plains covered with succulent grasses—a good pastoral region.

South and west of Tierra del Fuego, as far as the Pacific entrance to the straits, are the last vestiges of the Cordillera of the Andes. They are torn through in all directions by the ocean, and are hilly, rocky, mountainous, forbidding and inhospitable in aspect, cut by tortuous, deep fjords and channels, and dominated by snowy crests and peaks, which send numberless glaciers into the gorges and valleys. The whole line of islands forms a gigantic, precipitous bulwark, a series of forts protecting the southern end of the continent from being torn away by the destructive force of the ocean waves, which the violent and almost continuous western and south-western gales savagely hurl against the barrier, forcing it to slowly yield. Saturated and sleet-laden clouds drive through the valleys and along the mountain slopes, which, up to the low snow-line, are generally clad with matted vegetation and deep beds of moss which cover a flooded soil.

My analysis shows that, in general, man finds himself confronted by severe conditions in his struggle with nature in South America. Thus far, however, his efforts to develop and utilize its vast resources have made its commercial history an epic. The thought naturally presents itself, that had North America fallen to the lot of the Latin race in the European occupation of the New World, and South America to the Anglo-Saxon, the former might still have maintained its old supremacy; for the more rapid progress of the latter may not be due so much to racial superiority as to advantageous geographical surroundings.

The CHAIRMAN (Colonel Sir Thomas Holdich, Vice-President): It is with very much regret that I have to state that through illness our President will not be here to-night. His absence is all the more to be regretted because he is personally familiar with that country about which we are to hear. It is, as it were, his own happy hunting-ground, and his remarks and criticisms on the paper that is to be read would have been most valuable and interesting to us.

I have to introduce Colonel Church. No introduction is really necessary, for he is a very old friend. As a traveller and explorer who has wandered, as he says, through pretty nearly every mule-track of South America, and as a gallant soldier who led a brigade at the early age of twenty-seven during that war which some of us may remember—the Civil War of America—he is always a welcome addition to our circle here. To-night, I claim your attention to him as a traveller and as a very close and faithful observer of men and things. I will not waste further time with any preliminary remarks. I will call on Colonel Church to read us his paper.

After the reading of the paper, the CHAIRMAN said: There must be several gentlemen here who are more or less acquainted with those regions of which Colonel Church has just been telling us, and we hope they will add to the interest of the evening by assisting in the discussion.

Mr. E. J. PAYNE: I think the first thing we should do is to join in the feeling to which you gave expression in your opening remarks at the absence of our learned President. Sir Clements Markham, I believe, received his first stimulus to geographical study in his early travels in Peru, and we all regret that he is not here to say what we should have been glad to hear him say on the paper. Sir Clements Markham has studied the Andes in all their aspects; he has travelled through every part of Peru; he has studied the language; and we shall all, I am sure, join in your regret, Mr. Chairman, that he is not present to give us the benefit of his criticism on Colonel Church's paper. But I do not think there is much in the way of criticism to be said. We have all listened to the paper with a feeling of admiration and of wonder at the immense amount of knowledge which Colonel Church possesses of the South American continent. There is not a mountain, there is not a river, there is not a plain, there is not a portion of the sea-coast, there is not an estuary in the South American continent, of which Colonel Church is not prepared to give us full particulars. He can tell us how many tons of silt every river brings down; he can tell us the height of the tides at every part of the coast, as well as the heights of all the mountains; and I am sure he has thrown the greatest interest over every feature he has put in his paper. I have sat at his feet for years, and I have listened to-night with deep interest to his lucid and eloquent exposition of the physiography of South America. I believe he was the first to explain in the *Journal* of this Society the way in which the Caribs explored the northern coasts of South and Central America, the West Indian islands, and probably ascended the Mississippi. He also discovered and communicated to the Society the ancient Moxos lake and the Pampean sea, the shore of which we believe to have been the original dwelling-place of the Incas; in fact, there is no part of this portion of the world on which Colonel Church has not thrown great light, and I am sure we have been deeply interested with his very lucid explanation of the geographical configuration of the continent. Never having been in South America myself, I do not feel that I can usefully add anything to what he has said in his paper. I am sure we are all looking forward to seeing the palæontological remains which have been brought here for our inspection, and I think we shall be anxious to shorten this part of the proceedings as much as possible in order to hasten to see them.

The CHAIRMAN: I think we are honoured by the presence of the Bolivian Minister, Señor Aramayo. Perhaps he will kindly favour us with a few remarks.

Señor ARAMAYO: I am not prepared to make any criticisms on the interesting address we have heard to-night; but I avail myself with much pleasure of this opportunity to acknowledge the admiration with which I have listened to Colonel Church's exposition of the geography of South America, of which he has acquired such extensive knowledge during his long stay and repeated travels, having at his command a rare spirit of scientific observation and the most commendable perseverance. I wish to express more particularly my thanks to him for having brought to the notice of this learned Society his knowledge of the topography and resources of that portion of the South American Continent which is comparatively so little known, and which is my own country—Bolivia. I am sure there are very few Englishmen or Americans who know that country so well as Colonel Church, but since the time of his visit a good deal has been advanced in the way of scientific investigation, and I have the satisfaction of informing the President that in the course of a few days I shall have the honour of presenting the Society with a map of the northern part of Bolivia, which is the result of various explorations carried out under the auspices of the Government. This map has been prepared by General Pando, the President of the Republic, who personally explored the region crossed by the rivers Madre de Dios, Inambari, Tambopata, Heath, and others. I may add that the present Government of Bolivia are making every effort to extend their explorations to all those parts of the national territory which are still unexplored, which will contribute to make the country better known in the scientific world. The military expedition to the River Acre, lately carried to a successful issue, will throw a great deal of light on that valuable territory. Another expedition is now ready to start from Pará to the sources of the Javary with Mr. Satchell, an English engineer in the service of Bolivia, as the technical chief. In the month of November last an exploration was also made, at the expense of the Bolivian Government, on the river Paraguay as far as the Laguna Gaiba, with satisfactory results, by Captain Bolland of the English Navy. All this will show that we are contributing our share and making every effort to forward a knowledge of these unexplored regions of South America.

The CHAIRMAN: There is another gentleman present who has considerable acquaintance with South America, I think—Mr. Howard Saunders. Perhaps he will favour us with his views.

Mr. HOWARD SAUNDERS: I am afraid that I can say little of importance about the very interesting lecture that we have heard, except to express my great admiration for the manner in which Colonel Church has given us his opinion upon the general configuration of South America, and the channels for communication and trade with the interior. He has not alluded this evening to a subject upon which he made a considerable mark a few years ago at the meeting of the British Association at Bristol—a vast estuary or lake which ran, at one time, nearly to the headwaters of the Paraguay. If Colonel Church did allude to it, I unfortunately missed it; but it is an interesting fact that an immense estuary existed, and Colonel Church has distinctly proved that it covered a very large portion of the headwaters of the Paraguay. Only a very small tide went up the lower portion of the estuary, which we now know as the La Plata, and there is a remarkable fact connected with its existence, in the coincident localization of a water-bird, the "rayador," which is well known in South America. It has this peculiarity, that the under mandible is very much longer than the upper portion. There are five species of these skimmers (*Rhynchopinæ*): one found in Asia, one in Africa, one in North America, one on the Pacific coast of South America and along the Amazon valley, and then this one, which is found only, as far as we know, in this great inland sea, or over the rivers which now drain what was the great inland sea.

With regard to the traffic and communication, I fully agree with Colonel Church in what he has said about the impracticability of carrying out any important communication over the Andes from the Pacific. Nobody who has not crossed the Andes can realize the difficulties of traversing those mountains. They are widest in about lat. 20°, and to the northward the ranges are exceedingly steep, and there are no roads. In crossing the Cordillera you have to dodge the two wet seasons, and these do not coincide. The object is to cross the western range at the time the rains are nearly over, and then reach the second range before the rains commence there. Then of course comes the question of getting down the rivers, which is always a very difficult one. I am glad to hear that steamers have actually reached the foot of the Pongo de Manseriche in Peru, because that is the place to which I directed my attention a good many years ago, being anxious to find out whether that obstacle to navigation could be blown up, and if so, how far navigation could be carried beyond it. I quite satisfied myself that on the Marañon, above that fall, there were so many more rapids that, even if the main Pongo were blown up, very little advantage would follow. There is little more to say, except to express my great esteem for Colonel Church's paper.

Colonel CHURCH: In view of Mr. Saunders' remarks will you excuse me if I take up one more minute of your time? [Here Colonel Church gave an outline of the Amazonas lake, the Mojos lake, and Pampean sea as described in his paper, pp. 385 and 387.]

The CHAIRMAN: More than ever do I echo the sentiments expressed by Mr. Payne of regret at the absence of our President to-night, and deplore my own ignorance of the geography of South America; but I must, however, acknowledge the efforts that have been made by Dr. Moreno on the part of Argentina, and Señor Bertrand on the part of Chile, to correct those deficiencies. I hope to know something more about it in time. There is, however, one point on which I can challenge Colonel Church's conclusions. He has spoken of Lake Titicaca as the highest lake in the world. Now, as the self-constituted champion of Asia, I know of one lake which bears the name of our late beloved Queen which is at least a thousand feet higher than Titicaca, and I think I know others that may be higher; but they all bow their heads to Lake Victoria. These, however, are matters of detail, and I think we can all agree to join in a cordial vote of thanks to Colonel Church for the lecture which he has delivered, not only in an interesting, but in a most attractive, manner. I trust that hereafter we shall hear something more of South America from him.

NOTE ON TOPOGRAPHICAL WORK IN CHINESE TURKESTAN.

By Dr. M. A. STEIN.

In June last I was able to start, with the assistance of the Indian Government, on a tour of archæological exploration in Chinese Turkestan. The necessity of fixing accurately the position of ancient sites and of collecting fuller materials than hitherto available for the study of the historical topography of this region brought surveying operations into close connection with my immediate task. But from the first I was anxious also to utilize whatever opportunity the journey might offer for topographical work of a more general character. In

order to assist me in this direction Colonel St. G. Gore, R.E., Surveyor-General of India, very kindly agreed to depute with me one of the native sub-surveyors of his department, and to provide all necessary instruments. M. Ram Singh, the sub-surveyor selected, had accompanied Captain Deasy during his recent explorations in Chinese Turkestan, and was thus specially qualified to render useful services. In the present note I wish to give a brief preliminary account of the topographical work so far effected in connection with my tour.

The Government of India having allowed me to use the Gilgit-Hunza route for the journey to Kashgar, I reached, at the close of June, Chinese territory on the Taghdumbash Pamir by the Kilik pass. A plane-table survey, on the scale of 8 miles to the inch, was there commenced and carried down to Tashkurghan, and hence to the Sarikol valleys west of the Mustagh-ata chain. It was supplemented by triangulation, based on the points supplied by the Pamir Boundary Commission's and Captain Deasy's surveys, and further by photogrammetric work, for which I was able to utilize a Bridges-Lee photo-theodolite, kindly lent to me by the Indian Meteorological Department. Special attention was paid here, as well as along the routes subsequently followed, to the local nomenclature. In Sarikol frequent doublets of local names were noted, which curiously reflect the mixture of Iranian and Turki elements in the population, and also account for the variations in earlier traveller's records. In the matter of historical topography, it may be of some interest to note that the localities visited by Hiuen Tsiang, the famous Chinese pilgrim of the seventh century, on his passage through these mountains could be traced with certainty. The evidence thus obtained distinctly supports the identification of Tashkurghan with the *λίδινος πύργος* of Ptolemy.

From the spurs of Mustagh-ata the triangulation was extended to the great glacier-crowned ranges to the north and north-east overlooking the "Little Karakul" lake and the valley which drains it. The slopes of the "Father of ice-mountains" itself supplied a series of splendid survey stations, the maximum elevation reached being over 20,000 feet on the ridge that flanks the Yambulak glacier from the north. This ridge in the summer of 1894, when Dr. Sven Hedin made his ascents, was almost bare of snow. In July last it was found to be covered from *circ.* 15,500 feet upwards with heavy masses of snow, which greatly impeded the ascent. They seem to have been accumulating for the last two or three years, and may gradually transform themselves into an ice-mantle such as lies over the other elevated slopes of the great mountain. The weather was by no means favourable, else the attempt might have been made to reach the col that divides the heads of the Yambulak and Kampar-Kishlak glaciers at a height of about 23,000 feet below the northern summit.

The route from the Mustagh-ata region down to the plains of

Kashgar lay through the Gez defile. As its lower portion was rendered impassable by the summer floods, it was necessary to take to the track across the series of transverse spurs known as "Tokuz-Dawan" ("the nine passes"). These marches were trying to man and beast, but afforded opportunities for mapping also the little-known eastern slopes of the great snowy range north of Mustagh-ata.

The excursions which I made during a longer stay at Kashgar to various ancient sites in the vicinity, were utilized also for survey work. A couple of clear days, such as rarely fall to the surveyor's lot in the dust-laden atmosphere of Eastern Turkestan, made it possible to sight again the series of great snowy peaks previously triangulated from the neighbourhood of Mustagh-ata. It may be hoped that these observations will be useful for the final determination of the exact longitude of Kashgar.

In September I marched to Yarkand by the route which crosses the tract of moving sands around the shrine of Ordam Padshah. Our plane-table survey checked by astronomical observations indicates for this curious locality a position differing not inconsiderably from that in earlier maps. From Yarkand to Khotan I followed the great caravan route leading along the edge of the desert. In view of the historical importance attaching to it as the great thoroughfare by which, in earlier times, the trade from China to the Oxus region and the far West mainly passed, it may be noted that I was able to trace a number of ancient sites along it, and in particular to identify those named by Hiuen Tsiang in connection with his return journey from India. In regard to these and to the various localities in the Khotan district which the pilgrim visited and described in his 'Records of the Western World,' his guidance has proved quite as accurate as we are accustomed to find it on Indian soil.

The Khotan oasis and the desert region near it have in recent years furnished so many finds of great interest to the student of Indian antiquities and of Buddhism that it was necessarily from the first singled out as the special field for my archæological work. The longer stay implied hereby, and in particular a delay necessitated by preliminary arrangements for the exploration of certain desert sites, have permitted me to devote also some weeks to a geographical task of special interest. Our knowledge of that portion of the Kuen-luen range which contains the headwaters of the Yurung-Kash or Khotan river, has so far been very scanty, having been practically restricted to the sketch-map illustrating the route by which Mr. Johnson, in 1865, had made his way down to Khotan. Colonel Trotter, of the Survey of India, in his report on the topographical work of the Yarkand Mission of 1873, had already expressed the belief that the headwaters of the Yurung-kash were much further to the east than shown on that map, and probably identical with a stream rising on the high plateau south of Polu. Captain

Deasy, working from the side of Polu in 1898, succeeded in reaching this stream at an elevation of close on 16,000 feet, but was prevented from following it downwards. Thus the true course of the main feeder of the Yurungkash, where it cuts through the Kuen Luen range, together with most of the orography of the surrounding region, still remained to be ascertained.

In view of the close approach of winter, I set out for this task as soon as possible after my arrival in Khotan. Fortunately, no objections were raised by the Chinese administration to exploration in that direction, though at one time it had looked as if there were reason to apprehend them. On the contrary, Pan Darin, the Amban of Khotan, did all in his power to facilitate the arrangements for transport and supplies, and subsequent experience has shown me that without this ready assistance the tour through these mountains would probably have proved impracticable. I owe this and other valuable help rendered by Chinese officials undoubtedly to the kind offices and the influence of Mr. G. Macartney, C.I.E., the representative of the Indian Government at Kashgar.

The valley of the Yurung-kash becomes impassable within a day's march from its debouchure into the plains. Hence the route from Khotan to Karanghu-tagh, the southernmost inhabited place, leads over a series of ranges that separate side valleys draining from the east. On the first range crossed by the Ulugh-dawan at an elevation of *circ.* 11,300 feet, the effects of the dust haze rising from the desert plains were still too marked to permit of any distant view. But already from the next range, above Buya, a very extensive panorama was obtained. In a grand glacier-girt mountain, rising in solitary splendour to the south-east, it was impossible to mistake the "Kuen-luen Peak No. 5," already triangulated from the Ladak side, and marked in the tables supplied by the Survey Department with the height of 23,840 feet. The few Taghliks in the neighbouring valleys know no other name for it than Mustagh, "the ice-mountain." South of it there stretches a magnificent range of snowy mountains, forming the watershed towards the westernmost portion of Aksai-chin plateau. Its crest-line seemed nowhere to fall below 19,000 feet, but none of its peaks can rival the grand cone of "Kuen-luen No. 5." It soon became clear that the main Yurungkash stream has cut its way between this great peak and the range that is flanked by it on the east.

On the last of the outer ranges, above the Pisha valley, an excellent station was found, at a height of *circ.* 13,400 feet, for surveying the valleys of the numerous glacier-fed streams which join the main Yurungkash river from the south. Their courses, as well as that of the main river, lie in deep rock-bound gorges flanked by spurs of remarkable steepness. Owing to the rugged nature of the ground, the descent to the Yurung-kash was exceptionally trying, and almost impracticable

for the baggage. Fortunately it was possible to replace the ponies by yaks at Karanghu-tagh, a small settlement of Taghlik herdsmen, which also serves as a penal station for select malefactors from Khotan. It would be difficult to find a bleaker place of banishment. The Kash river, on which Karangu-tagh lies, comes from a series of magnificent glaciers below peaks that reach close to 22,000 feet, and carries a considerable volume of water to the main Yurung-kash, which it joins a few miles below the hamlet.

From Karanghu-tagh I endeavoured to follow up the gorge of the Yurung-kash as far as possible towards the east. The hillmen knew of no track leading to the head of the river; and, indeed, after a two days' climb over very difficult ground, a point was reached, *circ.* $79^{\circ} 59' 30''$ long., $36^{\circ} 2'$ lat., where the river gorge, winding round the mighty southern buttresses of "Kuen-luen No. 5," becomes quite impassable for yaks and men alike. The spot is known as Issik-bulak, from some hot springs that issue from the rocks above the river-bed. Beyond this point, which is *circ.* 9000 feet above the sea, the river, unfordable even at this late season, fills completely the narrow passage it has cut through the rocks. No practicable track could be found along the extremely precipitous slopes that descend to the river from the high snowy ridges on either side. For an attempt at further exploration of the gorge, it would have been necessary to await the complete freezing of the river. But, though the temperature at night went down on October 27 to 16° Fahr., this eventuality could not be expected for another month. Even then I doubt whether a practicable passage could be found, considering the climatic conditions and the masses of fallen rock likely to be encountered. The uppermost portion of the river-course will, therefore, have to be explored from the south-east, where Captain Deasy appears to have found comparatively open ground near the source.

From the Karanghu-tagh valley I proceeded, on October 30, to the west, following the path just practicable for laden yaks, which forms its only connection with the outer world besides the route *via* Pisha. Two main transverse ranges are crossed by this track; they separate the Nissa and Chash valleys, both draining towards the Yurung-kash, and equally inaccessible in their lower portions. By camping near the passes it became possible to climb to excellent survey stations, particularly on the Brinjak ridge (*circ.* 15,300 feet elevation).

Beyond Chash the Yagan-dawan pass brought us to the drainage area of the lower Karakash river. Extreme disintegration of the rocks, aided apparently by peculiar climatic conditions, has produced here a perfect maze of deep-cut arid gorges, amidst which mapping was very difficult. Want of water also proved a serious obstacle. Fortunately, it was possible to arrange for the transport of ice from the Mitaz valley. The last pass to be crossed to the plains was the Ulughat-dawan, *circ.*

10,100 feet above sea, south of Popuna on the Karakash. Though much lower than the previously crossed ranges, it offered a more extensive view, which fulfilled a hope I had almost despaired of. It showed not only the whole of the ranges previously surveyed, but beyond them, towards the upper Karakash valley, many high snowy peaks previously hidden. Among them two peaks, already fixed by triangulation from the Ladak side, could be identified with certainty. These points, in conjunction with the "Kuen-luen Peak No. 5," made it possible to determine the position of the Ulughat-dawan station by theodolite, and to measure angles to all the prominent heights of the ranges within view.

Subsequently we succeeded in finding another high ridge to the east, which offered an equally extensive view, and where a second triangulation station could be established. We had climbed it just in time. While still engaged on November 10 at the height of Kauruk-kuz, we saw a heavy storm from the desert northward pass over the plains. The dust-haze it carried along gradually enveloped the mountains, and further work became impossible. This fog-like haze, effacing all distant views, has since then continued to lie over the plains. But the prominent peaks in the outer range of hills immediately south of the town of Khotan, which have now been triangulated, are sure to be seen again in the course of the winter. This will complete the long-sought-for connection of Khotan with the trigonometrical system of the Indian surveys, and render the exact determination of its position possible.

CAN HAWKINS'S "MAIDEN LAND" BE IDENTIFIED AS THE FALKLAND ISLANDS ?

By Commander B. M. CHAMBERS, R.N.

QUESTIONS connected with the discovery of the Falkland islands are, no doubt, of less general interest now than they were when Junius raised such a storm by his indictment of the Government of the day and their treatment of the Spanish claims. Still, to those who love the sea-lore of the past, and who care to follow the footsteps of the early voyagers—so in some measure sharing those delights of discovery and adventure denied to us, living at a period when all the world is but a tourist's highway—to these such a question as that heading this article is of perennial interest. In this paper I propose first to show that the evidence of Hawkins having ever visited the Falkland islands is entirely insufficient, and then I shall endeavour to substitute a theory to elucidate the seemingly inexplicable account of that generally accurate chronicler.

Let me first take the earliest available authorities as to the discovery

of the Malouines, and see on what grounds the claims of Sir Richard have been so generally admitted.

In Sir Clements Markham's 'Life of John Davis,' p. 127, I find—

"John Davis. . . . Driven in amongst certain islands, never before discovered by any known relation, lying 50° or better from the shore east and north-east of the straits.* . . . Davis saw a succession of barren hills sloping towards low broken ground and rocky surf-beaten shores, with quantities of drifting kelp on the surface of the sea, and great numbers of birds."

Now, this description gives an excellent idea in brief of the Falkland islands, and there is no reason for doubting that the Falkland islands were really seen by him.

Pernelty's 'Voyage to the Falkland Islands,' Introduction, p. 10, edit. MDCCCLXXI., in a note giving an account of Sebald's discovery in 1600, reads thus :

"At our landing we discovered three islands about half a league in length, pretty high, and forming a kind of triangle, agreeable to accounts of Sebald's Islands. . . . If these islands were really Sebald's Islands, they would be about two leagues distant from the land or principle island, not seven or eight, as Frezier says."

Now, here again we have the distinguishing feature referred to, many islands. I consider that Steeple and Jason islands answer fairly well to this description, and are exactly 7 leagues from the main. Elephant Flat and South Jason also meet the description, and are 3 leagues from Cape Terrible. In either case the triangles are not very clearly marked, but this would account for the differences of opinion here quoted. In the Falkland islands it is not uncommon, even on a fine day, for a mist to shut an island absolutely out of view which has been in sight a few minutes previously, and without having seen the island disappear, one would never suspect that anything was hidden. There can be no question but that Sebald's islands formed part of the Falkland archipelago, and my object in quoting these descriptions is to show that the first impressions of both these discoverers was, that of islands, an impression singularly absent from Sir Richard Hawkins' account.

Let us turn to Hawkins' observations. I have before me the 'Hawkins's Voyages,' edited by Sir Clements Markham (Hakluyt Society, 1878). On p. 188 we find—

"The wind continued good with us, till we came to forty-nine degrees and thirty minutes, where it tooke us westerly, being, as we made our accompt, some

* I am inclined to believe that this should read in 50° or better, from the shore east and north-east, since the actual distance from the westmost islands to the straits is about 265 miles, and the bearing, provided the change in variation has not been very great (it was $22\frac{1}{2}^{\circ}$ E. in 1764), would agree with this somewhat vague estimate. The term "degree" seems to have, however, been rather loosely used; for Hawkins, just before sighting land on February 2, speaks of being some 50 degrees from shore. Pernelty speaks of Hawkins' discovery in 56° S. in '93 (? 94).

fiftie degrees from the shore.* . . . The second of February, about nine of the clocke in the morning, we descryed land, which bare south-west of us, which wee looked not for so timely; and coming neerer and neerer unto it, by the lying, wee could not conjecture what land it should be; for we were next of anything in forty-eight degrees, and no platt nor sea-card which we had made mention of any land which lay in that manner, heere about that height; † in fine, wee brought our lar-borde tacke aboard, and stood to the north-eastwardes all that day and night, and the winde continuing westerly and a fayre gale, ‡ wee continued our course alongst the coast the day and night following. In which time wee made accompt we discovered well neere *three score leagues* of the coast. It is bold and made small shew of dangers.§

"The land is a goodly champion country, and peopled; we saw many fires, but could not come to speake with the people; for the time of the yeare was farre spent, to shoot the Straites, and the want of our pynace disabled us for finding a port or roade; not being discretion with a ship of charge, and in an unknowne coast, to come neere the shore before it was sounded; which were causes, together with the change of winde (good for us to pass the Straite), which hindered the further discovery of this land, with its secrets; this I have sorrowed for many times since, for that it had likelihood to be an excellent country.|| It hath great rivers of fresh water; for the out-shoot of them colours the sea in many places, as we ran alongst it.

"It is not mountaynous, but much of the disposition of England, and as temperate. The things we noted principally on the coast, are the following: the westermost poynt of the land, with which we first fell, is the end of the land to the westwardes, as we found afterwards.¶ If a man bring this point south-west, it riseth in three mounts, or round hillockes; bringing it more westerly, they shoot themselves all into one; and bringing it easterly, it riseth in two hillocks. This we call point Tremountaine.

"Some twelve or fourteene leagues from this point to the east-wardes fayre by the shore, lyeth a low flat iland of some two leagues long; we named it *Fayre Iland*; ** for it was all over as greene as any meadow in the spring of the yeare.

"Some three or four leagues easterly from this iland, is a goodly opening, as of a great river, or an arme of the sea, with a goodlie low cuntrye adjacent. And eight or tenne leagues from this opening, some three leagues from the shore, lyeth a bigge rocke, which at the first wee had thought to be a shippe under all her sayles; but after as we came neere, it discovered its selfe to be a rocke, which we

* ? leagues, or is it possible he meant this to be his longitude. Early cartographers have placed the Falkland islands in from 40° to 50° west longitude.

† It is a curious thing that Pepys island should have been in 47°, not unlikely the same point.

‡ In early records this by no means implies excess of wind. In an old log of the battle of Beachy Head, I find the term "gale" occurring for a whole week in what was obviously fine weather.

§ See small chart. They could not have explored half this distance on the Falkland island north coast.

|| I do not think there is even one moderately large stream running into the sea on the west shore Falkland island.

¶ There is a plate in Anson's 'Voyages of C. Blanco' in which three peaks are shown, but it is too indefinite to deduce much from.

** I do not know any island, either on the coast or islands, which meets this description.

called Condite-head; for that howsoever a man commeth with it, it is like the condite heads about the city of London.

"All this coast, so farre as we discovered, lyeth next of anything east and by north, and west and by south. The land, for that it was discovered in the raigne of Queens Elizabeth, my soveraigne ladye and mistres, and a maiden Queene, and at my cost and adventure, in a perpetuall memory of her chastitie, and a remembrance of my endeavours, I gave it the name of Hawkins Maiden land.

"Before a man fall with this land, some twentie or thirtie leagues, he shall meete with bedds of oreweed, driving to and fro in that sea, with white flowers growing upon them, and sometimes further off; which is a good show and signe that the land is neere, whereof the westermost part lyeth some three score leagues from the nearest land of America.*

"With our fayre and large wind, we shaped our course for the straites; and the tenth of February we had a sight of the land, and it was the head land of the Straites to the north-wards, which agreed with our height, wherein we found ourselves to be, which was in fifty-two degrees and forty minutes."

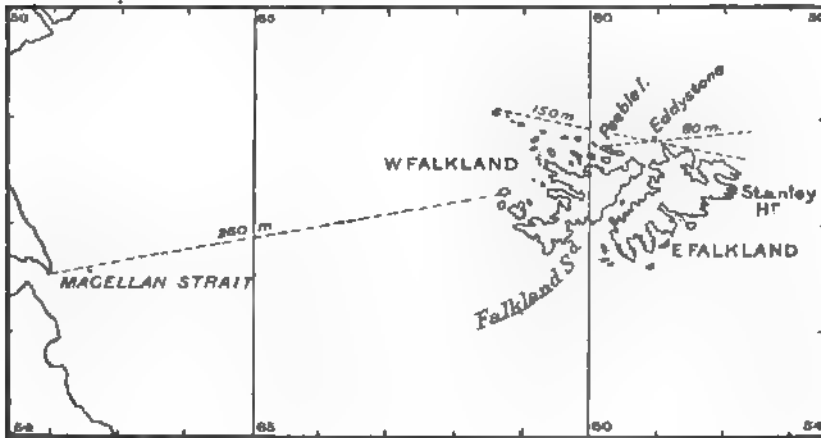


CHART SHOWING POSITION OF FALKLAND ISLANDS RELATIVE TO STRAITS OF MAGELLAN.

Here, then, is surely sufficient evidence to prove or disprove the statement, or, at least, a goodly array of facts on which to base our inquiry. Unfortunately, there is not available a map of the Falkland islands which is of sufficient size to clearly show all that we require. It is therefore necessary to turn to the Admiralty charts for information. The Admiralty charts 1354 a and b, obtainable from Messrs. Potter & Co., The Poultry, London, give all that is required, although the scale is over-large for reproduction.

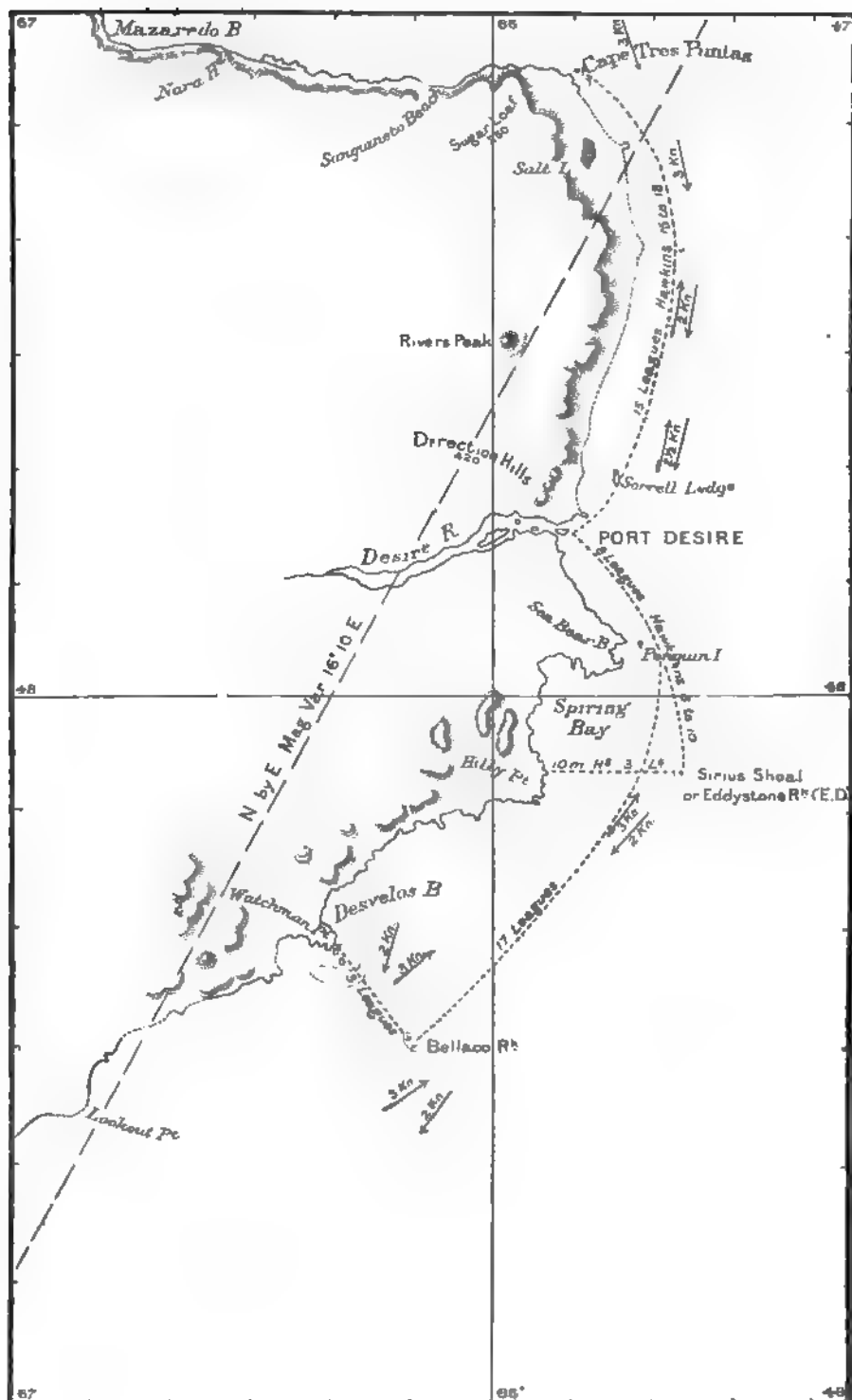
Let us first suppose that it was the north coast of the Falkland islands which Hawkins "descried" upon the morning of February 2, 1592, and then, examining the chart, let us consider what he would

* On chart over 260, and the prevailing current would have seemed to make it more.

have seen had he really made the north-west point. The view from seaward would consist of a long range of high-peaked islands, stretching away to the westward. On the other hand, an upland mountainous country whose summits are generally swathed in the low-lying clouds of these regions. It is obvious that this will not meet the description of a low though bold and unbroken coast; the impression is more that of Davis and Sebald, islands everywhere. Running the eye along the coast-line to the eastward, whose general direction is, as Hawkins truly says, east and by north, the first piece of land which will even approximate to his description is Pebble island. This island contains three conspicuous peaks, and might be taken for part of the mainland if not too closely approached; but the eminences are rather fairly high hills than hillocks or little mounts, their heights being 790, 710, and 918 feet, otherwise their disposition agrees fairly well, for on a south bearing the three hills are clearly separated; from the east they would draw into line, though to bring this about the ship would be embayed in Falkland sound; whilst to see them at all from the westward, though two peaks only would show, I feel quite certain such a careful navigator as Sir Richard would never have brought "his ship of charge" into such a pass. Besides, he must then have seen the Port Egmont Cays and Keppel island. However, since we have no choice but to accept this island, let us suppose these other marks were hidden by a mist, so that Cape Tremontaine seemed the north-west point of the land, and let us continue with the description. Where is the low flat island 14 leagues along the coast to the eastward? Echo answers, where? There is not an island to answer the description, or indeed any island in the least resembling it along the whole length of the north shore. Such islands as there are are covered with high tussock bogs, which might be taken for greensward afar off, but there are none on this part of the coast.

Falkland sound must answer for the goodly opening as of a great river; but I have never seen any discoloured water to speak of in a considerable experience of the Falkland-island coasts, and instead of being 15 to 18 leagues from the point of the three hillocks, it is but 9. It may be considered that this discrepancy is due to a current,* so let it pass. Of course the Condite rock could be nothing except the Eddystone rock, which does resemble a ship under sail, but this is only 4 leagues from the entrance to the sound at best, whilst it should be 10 leagues, and it is also too close to the shore. Where,

* It is obvious that Sir Richard, or rather his pilot, was not a good judge of currents, *vide* p. 174, where the author speaks of Ilha Grande being but some 12 or 14 leagues from Cape Frio. It is actually over 50 leagues, but the wind being light, and the current generally setting strongly to the west in the offing, we find this enormous error in a short distance. Hawkins's bearings are also generally rather vague throughout.



TRACING FROM ADMIRALTY CHART 1284, SOUTH AMERICA, SHEET X. (THIS SHEET IS SOMEWHAT SKETCHY IN ITS DETAILS, DATING FROM 1824.)

too, is our "goodly low countrie adjacent" to the opening of the great river? The land on each side of the sound is high and mountainous, 1220 feet, rising to 2000 on the one hand, and 700 rising to over 2000 feet on the other; this can hardly be said to fit by any manner of means.

Hawkins tells us that he explored threescore leagues of coast-line, but the coast of the islands which are available for exploration only amount to 30 leagues at best. Neither can the climate be said to resemble that of England in any way. If Hawkins remained upon the coast of the Falkland islands for more than a couple of days at most, I feel sure that he would have had cause to speak less kindly of the weather than he does. Turning to the 'Admiralty Sailing Directions' (South America), p. 16, chap. i., I find, "Wind is the principal evil at the Falklands; a region more exposed to storms both summer and winter it would be difficult to mention; the winds are variable, seldom at rest when the sun is above the horizon, and very violent at times. During the summer a calm day is an extraordinary event; generally speaking, the nights are less windy than the days: *but neither by night nor by day, nor at any season of the year, are these islands exempt from sudden and severe squalls, or from gales which blow heavily, though they do not last many hours.* The prevalent direction of the wind is *westerly*; gales in general commence at north-west and draw round to the south-west. The average velocity of the wind is about 340 miles, and the greatest velocity recorded during 24 hours was 999 on June 18, 1877, and the least 66, July 1, 1877."

These statements are not in the least overdrawn, and I much doubt that, had Sir Richard found himself as far to leeward of his correct course (ships should keep close to the land in making the straits), he would have ever made the straits with as little difficulty as he seems to have done, remembering that the ships of that day would probably not lie closer than seven points of the wind at best.

It may be worth mentioning here that the Falkland Island Company schooners, capital sailers, mostly ex-yachts, often take more than a week to make the west island from Stanley harbour.

As to the question of the latitude, Sir Richard states near 48°, though he gives the latitude of the straits almost correctly. We are told that this 48° should have been 50°; but supposing that both authorities are quoting from memory, I would prefer to trust Sir Richard, who certainly seems to have had a good memory for figures. To my mind, however, the strongest argument against the Falkland-island theory is that we hear nothing about the voyage returning along the coast. Let us suppose that the *Dainty* turned back soon after passing the Eddystone rock, and shaped a course for the straits with a wind "good for us to passe," how would it have been possible for her to have avoided passing through the Jason islands? and yet of this

we hear nothing. There is also the question of the fires and the actual seeing of inhabitants implied. The Falkland islands had no aborigines, and until the landing of the French settlers in 1764 there were no inhabitants whatever. In such a cold and moist climate, and where lightning is a rarity, there would be small chance of the grass taking fire, except as an extraordinary event, and yet Hawkins seems to speak of many fires; on the coast this lighting of signal fires has always been a characteristic feature. I fancy the impartial reader who has troubled to follow me so far will be fully convinced by this time that, whatever land Hawkins saw, it was not the north coast of the island. A very cursory examination of the chart will dispose of the question of its being any other part of the islands; indeed, I fancy it is only the difficulty of finding any reasonable supposition which has allowed the idea that Hawkins's "Maiden land" and the Falkland islands were one, to be adopted as one of the canons of nautical history.

The question now naturally presents itself, if not the Falkland islands, where was the land which Hawkins undoubtedly saw. It is natural to turn to the map of the coast, and in "next of anything" 48° , let us see what we find. Curiously enough, in lat. $47^{\circ}5'$ S., lies a point,*—Cape Tres Puntas—which at once attracts attention by reason of its name, not less than its marked and salient position on the coast, for it is the commencement of an outlying flange which runs, not in truth east and by north, but north and by east, and is rather over threescore miles (not leagues) in extent. In the centre of this piece of coast, and just 14 leagues from Cape Tres Puntas, is the Desire river. Sir Richard's least estimate of the distance between the goodly river and the cape of three hillocks is 15 leagues, and the tides are strong on the coast. This coincidence is sufficient to attract attention at once.

Nearly 8 leagues from the Desire river lies the Serius, or Eddy-stone rock, which agrees almost exactly with Sir Richard's estimate. This rock, as its name would seem to indicate, was at one time of considerable height, and was marked as such in the old charts; it is now supposed to have become worn away by the action of the sea, and is a rock awash. Some authorities state that it is the same as the Bellaco reef, but this is doubtful; either position would agree as to distance from the shore, and the Bellaco resembles a ship under sail. But if the Bellaco be taken to be the Condite rock, some little adjusting of the distance run must be made to agree with the larger estimate of 10 leagues. Its actual distance is 17 from the Desire river; but, as I have before stated, Sir Robert was not great upon dead reckoning, and the currents are strong in that part, up to 3 knots an hour being experienced.

* See note Pepys island. Captain Cowley speaks of rocks and sand and spacious harbours in the lat. C. Blanco.

The coast in all this district is low and undulating, much what Sir Richard, who was more familiar with the south coast of England than the sterner northern parts of the British Islands, would consider "of the disposition of England." The weather is far milder than in the Falklands, and at that time it must have been well peopled by a race who delighted to raise signal smokes to attract the attention of passing vessels.

The question now arises where is Fayre island to be found? It certainly requires some stretching to believe that Sorell ledge, which occupies the position indicated with reference to the Desire river, can have been diminished by the erosion of the sea to this extent, though the changes which have taken place on this part of the coast are undoubtedly considerable—*vide* recent surveys of Port S. Julian as compared with those of Nasoa. It is, of course, also possible that the so-called island, the ship not being very near, and telescopes not yet discovered, may have been merely a strip of green sward upon the coast itself. There is no such strip on the west coast of the Falklands. As for Cape Tres Puntas, the Sailing Directions thus describe it: "Is the termination of a long range of tableland trending north and south; . . . the cape shows three distinct upright heads of a light earthy-coloured cliff." There would probably be plenty of discoloured water about, also kelp in the vicinity. One argument more before I come to my summing up. If this coast be followed for a distance of three-score leagues, and then course be set for the straits, the remaining distance will be just about as estimated by Hawkins—another three-score leagues, or 180 miles.

Of course, there are two obviously weak points in identifying this coast as Hawkins's Maiden land: first, it would be necessary to bring the ship to the wind upon the starboard tack (or right hand) instead of the "larborde;" and, secondly, the direction of the coast is W. by E., and not E. by W. My theory to account for these discrepancies is this. I believe that Sir Richard, being considerably out in his reckoning, had no doubt, when first sighting Cape Tres Puntas, that it was as he says, "a land not shown on any sea-card." As he followed the coast, I fancy a suspicion must have grown upon him as to the true facts of the case, but after having so far committed himself as to name the new land, we may feel sure he felt no desire to prove himself in the wrong.

When his crew, whose only knowledge was that they had sailed along a strange land to the east of the straits, returned home and told the story, the land would naturally be identified by the popular voice with that recently reported by Davis, and this identification was probably accepted by Hawkins without going deeply into the question of bearings and lay of the land, etc. When, in later years (probably twenty-five years after), Sir Richard wrote his observations, the general

trend of the land on the north coast of the islands was fairly well known. He may even have conversed with Davis or members of his crew.

It is hardly likely that many papers were brought to England by Sir Richard after his long captivity, and one can well imagine the aged seaman looking at a modern sea-card as he wrote his observations, and concluding that for once his memory must have played him false, as he substitutes the word "larborde" for "starborde," and "east and by northe" for north and by east, since, as he would no doubt say, "how could it be otherwise, seeing with a north-westerly wind we ran along this coast?"

I do not think that any one who knows the strange tricks which memory plays will disallow the possibility of this theory, which at least has the advantage of fitting all the curious corners of this otherwise inexplicable account.

SEBASTIAN MÜNSTER.*

By C. RAYMOND BEAZLEY.

THIS claims, apparently with justice, to be the first thorough examination, from original sources, of the life and works of one of the greatest among the scientific humanists; and special attention has been paid to the bibliography of the subject. Besides a life of Münster (pp. 15-33), we have a detailed examination of his work as cosmographer and cartographer (pp. 33-69, 69-125); and herewith special sections are devoted (among the eight chief works of the author) to the *Germaniæ descriptio* of 1530, the *Novus Orbis* of 1532, the *Mappa Europæ* of 1536, the *Rhætia* of 1538, the editions of Solinus, Mela, and Ptolemy of 1538-1540, and the great *Cosmographia* of 1544. As a cartographer, Münster is here especially studied in his relation to German lands; but a full account is given of the title, scale, size, orientation, contents, sources, and mistakes of every one of Münster's maps, in relation to all the chief parts of the world. Lastly, the labours of this many-sided scholar, in the more purely mathematical and astronomical side of his subject (pp. 125-130), are dealt with, and even his Hebrew studies are not forgotten. Münster's geographical knowledge was based on what he learnt from Pellikan and Stöffler. From the former he acquired his first instalment of map-science, from the latter a thorough familiarity with the works of ancient geography, and in particular of Ptolemy. At Heidelberg he pursued his cosmographical studies with

* 'Sebastian Münster: Leben, Werk, wissenschaftliche Bedeutung.' Von Viktor Hantzsch. Leipzig: Teubner, 1898 (in the eighteenth vol. of the Publications of the Royal Society of Sciences of Saxony, Historico-philological section).

great zeal, and in 1528 brought out a brief *Erklerung des neuen Instruments der Sonnen nach allen Seinen Scheyben und Circkeln*. With this went *Eyn vermanung an alle liebhaber der Künstenn, in hilff zu thun zu warer und rechter beschreybung Teütscher Nation*. In the latter, where the plan of much of his most important work is foreshadowed, he complains of old-standing inaccuracies, refers to the previous efforts of Conrad Peutinger to obtain a reliable topography of the Augsburg district, and supplies directions for the detailed observation and surveying of a given district. In spite of slender encouragement, Münster began to fulfil his promise of encyclopædic work (in August, 1530) with the little *Germaniæ descriptio*; and a year after the appearance of this book, towards the end of 1531, he began to take part in the *Novus Orbis* published by J. Herwagen of Basel in 1532. This contained many of the best ancient and modern travel-descriptions, and was accompanied by a *mappe-monde* designed by Münster, of elliptical shape, and illustrated by a short commentary. Here the roundness of the world and its division in zones and continents, including the new (but unnamed) regions of the west, is assumed; the 'uninhabitable' tropics are noticed as an exploded fallacy of the ancients. Brief summaries are given of the discoveries of Columbus, Vespucci, Varthema, and the Portuguese, and a curiously pessimistic description of Germany occurs. Münster's editions of Solinus and Pomponius Mela in 1538, and of Ptolemy in 1540, showed not only a good deal of philological study, but a keen insight into mathematical geography. The difficult passages of Ptolemy's first book on cartographical representation, and especially on the two most favoured projections of the Alexandrian geographer, are well explained with the aid of plates; but no reference is made by the editor in his additional remarks to the new discoveries, except in the case of Varthema's travels. The continents are defined in a strictly antique manner (as separated by the Nile, Tanais, etc.); and absurd etymologies, useless digressions, and occasional trivialities disfigure an otherwise excellent piece of work.

The *Cosmographia* (*Beschreibung aller Lender*) of 1544, for which Münster had been preparing during the last eighteen years, was the first detailed, scientific, and at the same time popular, description of the world which had yet appeared in German. In it more than 120 persons—writers and scholars, artists and men of affairs—had taken part, and the result was a crowning effort of the geographical literature of the Reformation period. In the preface the end in view is defined as a 'description of the whole world with all that therein is;' but this includes a very complete treatment of mathematical geography, and of astronomy, history, and all other kindred or illustrative sciences or studies. Even the story of human culture is recounted from the Creation to the date of writing. Among the sections of this great treatise, the third book, on Germany, is the most important; the fourth and fifth, on

Northern and Eastern Europe, and on Asia and the new-found islands, are perhaps the least valuable; for here, *e.g.*, Greenland is treated as a peninsula running off from the country of the Lapps, and no attempt is made to bring Asiatic and American 'Earth-knowledge' up to date. The old stories from Pliny and Solinus are repeated; the contemporary colonial enterprises of the Fuggers of Augsburg in Chili and the Pacific, the flourishing trade of German merchants in Brazil, and the enterprises of German fortune-hunters in Venezuela, are not even glanced at in a treatise whose special object was the instruction of Germans. On the other hand, Western Europe is excellently treated, and the popular and even brilliant style of the writer attracted all the educated world; his impartial tone secured as warm a welcome among Catholics as among Protestants; forty editions appeared in Germany alone; and for more than a century the book was prized as one of the chief treasures of German literature and science. In many families it was handed down from father to son as a kind of secular bible, and its extremely rich assortment of quotations from, and references to, ancient sources, uncritical as these often were, gave no little satisfaction to sixteenth-century readers. Scarcely any prominent historical or geographical author of Münster's own period is unnoticed in the *Cosmographia*, and among the rest may be instanced Waldseemüller, Schöner, J. Honter, P. Appianus, Seb. Franck, Paulus Jovius, Damian de Goes, J. Ziegler, and Ægidius Tschudi. The city- and costume-pictures and the portraits, especially of the 1550 edition, are still valued by artists and antiquarians, and have been often reproduced; immense additions were made in the author's lifetime, especially as to Western Europe (England, France, Spain, and Italy); and the original six books gradually swelled to eight. But just as the final form of the *Beschreibung* shows a steady improvement in the consultation and intelligent use of all material available for the Latin and Teutonic world, so the neglect of literature relating to Asia, Africa, and America continues, like the old faults of uncritical scholarship and excessive attention to the anecdotal and adventurous elements in history and geography.

Lastly, in cartography Münster was not, as he has sometimes been called, the earliest German atlas-maker, but he was the first who popularized a field where his chief predecessors, Waldseemüller and J. Ruysch, M. Behaim and Schöner, had done such admirable pioneer work. In twenty-six years their untiring and versatile successor published one hundred and forty-two maps, of which the value was by no means uniform, but which together formed a material addition to earlier studies. In the present monograph no pains have been spared, and the result is eminently satisfactory; if anything further could have been desired, it would have been, perhaps, the reproduction of some typical sections of Münster's *tabulæ* and *chartæ*.

THE MONTHLY RECORD.

EUROPE.

The Former Extent of Forest in Scotland.—In a paper reprinted from the *Annals of the Andersonian Naturalists' Society* (Glasgow, 1900), Mr. Hugh Boyd Watt discusses the question of the extent of Scottish forests and woodlands in early historic times, as indicated in the works of Roman historians and early English writers, as well by topographical or traditional evidence. The author quotes passages from the 'Agricola' of Tacitus, in which reference is made to woods traversed or cut down by the invaders, but considers that these probably do not cover much ground, and that it is inaccurate to say that the whole country was covered at this period with dense trees. The term "Caledonian forest," or an equivalent expression employed by such writers as Ptolemy and Pliny, seems, he thinks, to apply to a definite locality regarded by the Romans as pre-eminently woodland, which reached south to the heads of Loch Long and Loch Lomond, east to Stirling, and north to Dunkeld. With the extension of the name Caledonia—in which is probably contained the Gaelic root *coille*, "a wood"—to the whole of Scotland, the Caledonian forest has likewise broken its bounds and rolled over the whole country. In still earlier times, it is probable, as shown by the evidence of the present peat mosses and bogs, that one vast forest, of which the "Sylva Caledonia" was but a scanty remnant, covered the greater part of the country. In many widely separated localities huge trunks have been found buried in the mosses, where now no natural wood of any size can grow; but the age of the forests which they represent cannot be laid down with certainty. In some cases they seem to date back beyond all written history, while in others the change from forest to peat-moss has taken place in quite recent times, being often due to violent hurricanes. The former abundance of wood is likewise shown by the fact that for ages timber was the staple material for house-building, and the only material for boat-building; by the frequent traces of "bloomeries," or iron-smelting furnaces, for which the only fuel, down to 1760, was wood or charcoal; and by the frequent reference to trees in Scottish place-names.

The Woods of the Thuringer Wald.—An interesting study, by Luise Gerbing, of the changes which have taken place within historic times in the composition of the woods of the Thuringer Wald appears in the *Mitteilungen des Vereins für Erdkunde zu Halle* for 1900. The writer divides the region in question into three zones—the first, extending from the confluence of the Werra and Hörsel to the Laucha, being that of deciduous forests; the second, reaching south-west to the Apfelstadt, consisting of mixed woods, in which, however, deciduous kinds predominate; while the third, and largest, in which conifers predominate, reaches almost to the town of Ilmenau. For each of these the writer examines the former state of the forests as indicated on the one hand by old records, and the evidence supplied by the names of the mountains and forests; and on the other, by the discoveries which have been made of the trunks of trees buried beneath existing peat-bogs. As regards the distribution of individual kinds of trees, the following facts are elicited. The oak is shown, by its frequent occurrence in place-names and buried beneath the surface of bogs, to have, in very early times, not only occupied the valleys and lower slopes, but to have ascended to the summit ridge of the Rennsteig. In post-mediæval times its chief habitat was on the southern margin of the range, where extensive forests entirely composed of oaks occurred. The beech originally formed the principal constituent of the mountain forests proper, but already in the sixteenth century its range had been much curtailed. It is uncertain whether the sycamore ever formed, by itself, entire woods, though the

evidence of nomenclature seems to point in this direction. The ash was once as widely distributed as it was highly prized, forming woods, not only on the lower slopes, but even on the summits. The mallow, once an occupant of mountain swamps, has almost disappeared with the draining of these, while the lime and elm were once more common than at present. The hazel was likewise much more widely distributed in the form of underwood. Of conifers, which in the "Schwarzwald" or eastern part of the district must always have occupied an important place, the spruce (*Picea vulgaris*) seems to have formed the exception, the silver fir (*Abies pectinata*) the rule. No place-names supply evidence of the presence of the former in pre-historic times, and only two or three of the latter. Within the last century, however, the silver fir has yielded more and more to the spruce. The Scotch pine (*Pinus silvestris*) has been stated to be non-endemic in this region, but the name Kienberg may possibly point to the reverse conclusion. The yew, which still lingers in a few localities, owes its diminished range in part to its use for making bows. The most salient fact brought out by the study is that of the rapid extension of coniferous, at the expense of deciduous, forests—an extension which promises to continue in the future, though at present it has hardly effected a radical transformation in the conditions in the Thuringer Wald.

The Growth of Vienna.—The preliminary results of the census of Vienna, taken on December 31, 1900, show that, including the military, the city has a population of 1,662,300—an increase of 279,700, or 21·8 per cent. since 1890. The number of houses has, on the other hand, increased by only 3800, or about 13 per cent., the difference being due to the increased size of the new buildings as compared with the older houses. The distribution of the increase, or more correctly the

Fig. I.

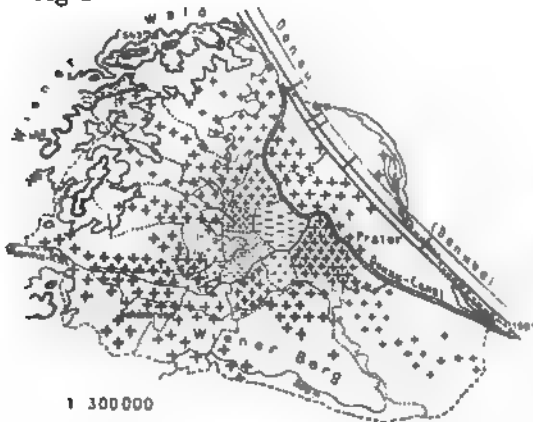


Fig. II.



SKETCH-MAPS ILLUSTRATING THE GROWTH OF VIENNA.

displacement of density within the city, is just that which is characteristic of important centres of industry and trade. Fig. I. shows that of the twenty districts comprised within the city, that known as the "Innere Stadt," occupying a position analogous to that of the "city" in the case of London, and the thickly populated portions grouped around the "centre of gravity" of the whole, show a decrease in population (denoted in the map by the minus sign) which reaches more than 14 per cent. in the case of the "Innere Stadt." The other enclosed districts have either increased very slightly, or at least at a rate below the average of 21·8 per cent. A

rate above this average is shown only by the outer districts—except those in the extreme north and south-east—and of these especially by those in the south and south-west. Here, where the fringe of the inhabited ground on the one hand ascends the gentle rise of the Wiener Berg (defined in Fig. I. by the contour-line of 200 metres), and on the other spreads farther and farther over the broad valley of the Wiener Fluss and the slopes of the Wiener Wald, which even within the city limits reach the considerable altitude of 1780 feet; the population has in one decade increased by 46 to 51 per cent, or roughly by one-half. A comparative view of the size of the inhabited area in the case of London and Vienna is given in Fig. II., which shows the extent of settlement (shown for Vienna by the interior blank space) within a square of 100 statute miles, with the foci whence the growth has taken place. It clearly brings out the contrast exhibited between the action of the two great streams on the direction of growth of the cities, the broad outlines of the form being determined in the case of London by the meeting at right angles of two main lines of communication, the one taking its direction from the Thames, the other from the meridional extension of the island of Great Britain; while in the case of Vienna the outline is due to the form of the surface.

Resumption of the Survey of Greece.—The survey of Greece, which has been interrupted for some years as a result of the unhappy war with Turkey, is to be resumed during the present spring under the superintendence of Henrich Hartl, formerly colonel on the staff of the Military Geographical Institute at Vienna, and now professor at the Vienna University. Prof. Hartl was summoned to Athens last autumn to inspect the topographical bureau formerly established by him, and expressed his thorough satisfaction with the excellent arrangement of the material so far brought together, the only desideratum being a somewhat more complete training for the survey officers. The official order provides for the resumption of the cadastral survey by communes; but it is more than probable that the execution of this will again, as under Tricoupis, be frustrated through the opposition of the popular representatives to the introduction of a bill for the demarcation of boundaries. Prof. Hartl therefore hopes that the survey may at least be quickly brought to a conclusion on the uniform system requisite for a map of the whole kingdom which shall fulfil the requirements which may justly be made on it.

AFRICA.

The Position of El Obeid.—Writing from Goz Abu Guma, on the White Nile, south of Khartum, on February 23, Colonel the Hon. G. Talbot informs us that he had then just returned from a visit to El Obeid, the position of which he had fixed by means of the telegraph as in $13^{\circ} 10' 34''$ N., $30^{\circ} 13' 39''$ E., or considerably farther west than it has been hitherto placed on our maps. Very little of the old town is left, only a gateway of the old Mudirieh buildings. Colonel Talbot has also fixed a large number of positions by latitudes and chronometric longitudes, besides having some detailed topographical work done, so that he hopes to bring out some more provisional sheets of the survey during the summer.

Place-names in the Uganda Protectorate.—We have been favoured by the Foreign Office with a copy of a despatch from Sir Harry Johnston, laying down the correct spelling of various native names in the Uganda Protectorate, in addition to those already referred to in the last number of the *Journal*. Sir Harry Johnston urges that where native names are retained they should be so spelt and pronounced as to be recognizable by the natives, which at present is far from being the case, owing, in great measure, to the fact that the first explorers obtained the names mainly through Swahili porters and interpreters. He has taken much pains, by consultation with the missionaries and native authorities, to obtain the correct

rendering, which is given in the right-hand columns in the table below. A few words, such as Wadelai, Masindi, Ruwenzori, Unyoro, and Uganda, which have been established by long usage, have been left undisturbed, and this might, perhaps, have been the case with Mruli, which has maintained its station on our maps ever since Baker's time.

Incorrect form.	Correct form.	Incorrect form.	Correct form.
Njemp	Enjamesi	Fort Berry	Fort Portal
Eldoma	Eldama	Lake Choga	Lake Kioga
Usoga	Busoga	Szo, Scio river	Sio
Ugaya island	Bugaya	Kitakwenda	Kitagwenda
Uvuma island	Buvuma	Wakedi	Bukedi
Chagwe	Kiagwe	Mruli	Buruli
Bulamwezi	Bulemezi	Urega	Burega
Ntebe	Entebbe	Balegga	Barega
Ke- or Kasubi	Kisubi	Bugahia	Bugaya
Sesse	Sese	Chamburango	Kiambalango
Na- or Matiana	Mitiana	Ruisamba lake	Dueru
Uddu	Buddu	Ibanda (Ankole)	Iwanda

In Uganda proper, Sir H. Johnston says, any native place-name spelt with "ch" or "h" is wrong. For the former, "ki" must be substituted, and the latter must be omitted. The name Ruisamba is said to be merely that of a village on the lake, of which the proper name is Dueru. The names of Forts Edward, Lorne, Briggs, De Winton, Roddy, Lugard, and Wavertree should be erased, as they were applied to temporary stockades only. Fort George on the Albert Edward lake is, however, a permanent station.

German Boundary Expedition to the Kivu Region.—The arrival at Ujiji of the German expedition for the settlement of the boundary question with the Congo State in the region of Lake Kivu, is announced in the *Deutsches Colonialblatt* for March 15, in a letter from the leader, Captain Herrmann. During the journey from the coast a halt had been made at Tabora, in order to allow of the determination of the longitude of that important position by an observation of the solar eclipse of November 22. This was carried out successfully by Prof. Lamp, and the result should be to determine the longitude of Tabora with great exactness. During the march to Ujiji rain fell daily, the wet season having set in early, and promising to be marked by an unusually heavy fall. On December 10 the two Belgian commissioners arrived on board the German steamer *Hedwig von Wissmann* (see below), which made a great impression on Captain Herrmann. The *Good News* is now used as a sailing vessel, owing to an accident to her machinery. Captain Herrmann proposed to establish a station for the rainy season at Usumbura, where his Belgian colleagues would join him when ready to commence operations.

Boundary Survey on the Nyasa-Tanganyika Plateau.—The surveys of the German section of the commission by which this boundary was demarcated in 1898, have now been published in the fourth number of the *Mitteilungen aus den Deutschen Schutzgebieten* for 1900. The detailed nature of the surveys may be judged from the fact that the large scale of 1 : 100,000 has been employed for the 4-sheet map, which is still fairly well filled in the parts coinciding with the districts surveyed. These were not limited to the actual line of the boundary, but extended over a considerable area on the German side. The basis of the work was supplied by the astronomical observations and triangulation, fully described by Dr. Kohlschütter in the accompanying text, but the detail of the surface features is due to the careful plane-table work and compass surveys of Captain Herrmann, whose original map has been reproduced without alteration except where a trifling shifting of the triangulation points has been necessary to harmonize them with

Dr. Koblshütter's results. The boundary as laid down by the commissioners differs considerably from that fixed in 1890, especially in the western section. Instead of taking a straight course from the Kalambo to the 32nd meridian, it follows first the Safu tributary of the Kalambo, next the Mkumba and Rumi rivers to the confluence of the latter with the Saisi, and, after descending this river for some distance, crosses over to another tributary, which it ascends to the Congo watershed. As already stated by Captain Boileau in his paper read before the Society early in 1899, this water-parting, which for nearly a degree of longitude forms the boundary, has been shifted considerably to the south, so that German East Africa gains some territory at the expense of British Central Africa. In one section a portion of the Stevenson road, as originally traced, falls within the former. In one or two cases the commissioners have recommended a deviation from the water-parting, the change being to the advantage of Germany near the British station of Ikomba, which is now almost on the frontier, but to that of Great Britain near Ikaua. The most striking feature in the physical geography, as brought out by the map, is the great regularity of the escarpment of the plateau, known throughout its length as Chingambo, which has been sometimes spoken of as a mountain range. It has been carefully mapped for some distance, the routes of the German surveyors traversing it in no fewer than eleven places. It is continued with hardly a break in its uniformity north-west across the valley of the upper Saisi, while at its foot extends the plain which merges eventually with that of Lake Rukwa. Its slopes are stony and thinly wooded, but rubber is found in ravines. Captain Herrmann gives a brief description of the country and people along the frontier, and like other travellers, speaks very highly of the capabilities of the Buntali country north of the Songwe valley, which is said to be an ideal country for coffee. The best route between the two great lakes within German territory is said to lie in part along the Songwe and its tributary the Kiya, in part along the plains at the foot of the great escarpment, finally reaching Tanganyika at Kala ($8^{\circ} 10' S.$), though the line to be taken across the Fipa plateau is not mentioned.

German Steamer on Lake Tanganyika.—An account appears in the *Deutsche Kolonialzeitung* of January 24 of the launch on Lake Tanganyika of the *Hedwig von Wissmann*, the steamer which, as already mentioned in the *Journal*, was taken out in sections by the expedition *viâ* Lake Nyasa, commanded by Lieut. Schloifer. That officer's letters give a vivid picture of the difficulties encountered during the launching operations after the vessel was ready to leave the stocks. Kassanga, though the most suitable place which could be chosen on the part of the lake which was the scene of operations, had the disadvantage of a gently sloping beach, and it was only after fourteen days' hard work that the vessel was at last dragged into deep water. The christening ceremony having been performed by the wife of Lieut. Schloifer, more than seven hundred men were employed hauling on the ropes and chain-cables, which proved unable to stand the strain. Others were eventually borrowed from the British Flotilla Company, which is building a steamer at Nasakalawe, on the other side of the lake; and on October 4, 1900, the launch was successfully accomplished, though each day's work only sufficed to move the vessel a few yards. Mr. Ccdrington, Administrator of Northern Rhodesia, was present at the time. The vessel has since made her first trip northward, after taking on board eight passengers, mostly Belgian officers, at Kituta. The German station near the south-east end of the lake has been named Bismarckburg.

Steamer on Lake Mweru.—The small steamer (the *Scotia*) recently launched on Lake Mweru by the African Lakes Corporation, made a trip in October last from Chienyi, at the north of the lake, to the foot of the Mambilima,

or Johnston falls, on the Luapula, and back. Some difficulty was experienced in obtaining a supply of wood, the natives bringing it in small bundles of a few sticks only, and requiring payment for each bundle separately. The outward voyage was made along the east shore, where, down to the Kalungwizi, the land rises abruptly to a height of 100 to 150 feet, the water being generally deep close to the shore. In the Luapula, too, there is ample water for navigation, "no bottom" being the rule even at the height of the dry season. At the falls, to the foot of which the *Scotia*, drawing 2 feet 9 inches to 3 feet aft, was able to steam, a station was being built for the British South Africa Company by Mr. Lyons. On the return voyage, a visit was paid to Kilwa island, which, though rising abruptly on the east, is low and flat, with grass and trees growing well out into the lake, on the south and west. The whole south-western bay of the lake is fringed with grass and mangrove swamp, and has a most uninviting aspect. From Kilwa the voyage was continued along the high western shore. The above details are from the log of the *Scotia*, extracts from which appear in the *Glasgow Herald* of March 7.

Exploration of the Ngoko.—The western branch of the Sanga, the Ngoko or Ja, has lately been explored beyond the point reached by Dr. Pleyn (*Journal*, vol. xiv. p. 444), by a Belgian engineer named Williams and the German Lieut. von Stein, whose work in the Cameroons territory nearer the coast has frequently been referred to in the *Journal*. Some details are given in the *Mouvement Géographique* of January 27 last (No. 4, 1901), which also announces the early return to this region of the well-known explorer Von Carnap. The examination of the course of the Ngoko below the rapids discovered by Dr. Pleyn (for which the name Pleyn rapids is suggested by M. Wauters) has shown that in August, when the river is at its lowest, navigation is possible by the small steamers of the South-Cameroons Company from its mouth, where it has a breadth of 200 yards, to a place called Mulundu. Beyond this the pass of Shama is impracticable at low water, though at high water (November) the depth is as much as 10 feet, increasing to 25 feet above the pass. At the Pleyn rapids the river dashes into a narrow gorge (40 to 50 yards), the sides of which rise 800 to 1200 feet above the water. Higher up the current is still very rapid, though the width increases to 160 yards, with depths reaching 25 feet. For a space the country is flat and swampy, but after some 30 miles the river flows between high mountains. This district is quite uninhabited, but elephants, hippopotami, crocodiles, and gorillas are met with. Rubber vines and trees were seen on the river-banks, together with wild coffee and vanilla.

AMERICA.

New Director of the Geological Survey of Canada.—The successor, as Director of the Geological Survey of Canada, to Dr. George M. Dawson, whose lamented death is referred to below (p. 438), is Dr. Robert Bell, senior member of the staff of the survey which he joined so far back as 1857. During his active career in connection with the survey, Dr. Bell has executed surveys, both geological and topographical, in almost every part of Canada, and has published a large number of reports and papers. One read before our Society in 1897, on Explorations south of Hudson Bay, appeared in the tenth volume of the *Journal*.

Geological Exploration in Alaska.—We learn from *Science* that an arctic party of the United States Geological Survey will this year proceed from Bergman, on the Koyukuk river, to the divide, and then descend some stream to the arctic coast, following this southward and westward. A second party will descend the Kowak river to Kotzebue sound, and a third will continue the investigation of the Copper river region.

The Tectonic Lines of Central America.—The paper in which Dr. Carl Sapper last year described before the Berlin Geographical Society the main results of his twelve years' researches on the physical geography of Central America has been printed in the eighth number of the *Verhandlungen* for 1900. Dr. Sapper began by pointing out the characteristic manner in which most of the Central American ranges, especially in the northern half of the country, run in regular curves, generally concave to the north, as is well shown by the diagrammatic map which accompanies the paper. In the south the only well-developed arc is that of the central chain of Costa Rica, and it is not yet certain whether this is of the same age as the older part of the northern chains. In these, archæan rocks play a conspicuous part, certain whole chains being formed of gneiss, mica-schist, and phyllite. These primitive ranges, which have their continuation in South-West Mexico on the one side and in the Greater Antilles on the other, were dry land during the first half of the Palæozoic epoch, but were, in part at least, covered by sea during the Carboniferous period, the end of which was marked by a new period of folding, during which the greater part of the old eruptive rocks seem to have been poured forth. After this, most of the country was above water till towards the close of the Mesozoic epoch, only to be submerged again, with the exception of the Palæozoic chains, during the Cretaceous and Early Tertiary. The Mesozoic folded ranges are best developed in the west, in Chiapas and Central Guatemala; between which two districts they are broken through by the depression of the Peten. In Honduras and Nicaragua they play a part of diminishing importance. In the former, the Esquias range shows a north-to-south strike, which seems to point to the conclusion that the remarkable depression which crosses Central America between Puerto Cortez and Fonseca bay may be due as much to tectonic causes as to denudation. In Nicaragua an unusually important part is played by new volcanic outpourings, which seem to have taken place towards the end of the Miocene period. This was a time of renewed great dislocations, which have been the chief agents in determining the present surface features of Central America, though there have of course been more recent oscillations, such as have added to the area of the Yucatan peninsula, and given rise to the present coast conditions of British Honduras. The majestic volcanoes of Central America were likewise formed as late as, if not later than, the Pliocene period. The later part of Dr. Sapper's paper deals with the climate and vegetation of Central America, as influenced by the surface features. In the absence of extensive plains, a great variety of climatic conditions is brought about by the variations of relief. The popular division of the country into the three zones of the *tierra caliente*, *templada*, and *fria*, is based on altitude, but the rainfall of different districts depends largely, at least during the prevalence of the trade winds, upon the direction of the ranges, and the great variation in its amount and distribution through the year has an important effect on the vegetation. Where the fall exceeds 80 inches and is distributed over the whole year, rich tropical forests are found. Where, however, it varies between 40 and 80 inches, and there is a well-marked dry season, these give place to light forests of pine and oaks; and if the fall is less than 40 inches, the prevailing form is that of savannas or bush steppes. Tropical forests occupy a large area between the plateau of South Yucatan and the chain of Central Guatemala; the seaward face of certain ranges in Chiapas and Honduras; and the eastern slope of the central plateau of Nicaragua. Historical factors have been of importance in the distribution of the flora as well as in that of the fauna and native population. In all three the influence both of North and South America is clearly discernible.

Census of Porto Rico.—The U.S. War Department has lately published the leading results of the census of Porto Rico taken under its direction in the autumn

of 1899, a summary of which by Mr. Henry Gannett appears in the *Bulletin* of the American Geographical Society, No. 4, 1900. The plan and administration were similar to those of the United States census, the island being divided into seven supervisors' districts, corresponding to the seven governmental departments, and each of these into numerous enumeration districts, with an average population of about 1000. The total number of inhabitants of Porto Rico was 953,243, as compared with 798,565 in 1887, the date of the latest official Spanish census, indicating a decennial rate of increase of 16·2 per cent., a rate about the same as that of Ohio during the decade between 1880 and 1890. The population by department in 1899 was as follows: Guayama, 111,986; Humacao, 88,501; Ponce, 203,191; Arecibo, 162,308; Bayamon, 160,046; Mayaguez, 127,566; Aguadilla, 99,645. Porto Rico, with an area of 3600 square miles, is, on the average, very densely settled, there being about as many inhabitants to a square mile as in the State of Massachusetts, but it is shown that, while in the latter State the greater part of the population is collected in cities, in Porto Rico the urban element is small, and the population is distributed uniformly over the island. While the ratio of children was higher in this island than in any State in the Union or in any country of Western Europe, marked differences appear at advanced ages. Persons over forty-five years of age in Porto Rico constituted only 11·8 per cent. of the population, while in the United States they constituted 17·2 per cent., a fact that suggests for the island a large death-rate and short life-period. Distributed by race, Porto Rico contained 59,390 negroes, 304,352 persons of mixed white and negro blood, and 75 Chinese, making a total coloured population of 363,817, or 38·2 per cent. of the population—a proportion about the same as in the State of Virginia, and somewhat higher than that of Cuba. The proportion of coloured was greater in the eastern part of the island than elsewhere. It appears, from comparison with figures of earlier censuses, that the coloured element, although increasing numerically, has decreased in proportion to the whites, as is the case in the United States and in Cuba.

Proposed Scientific Exploration in Surinam.—The last number of the *Tijdschrift* of the Netherlands Geographical Society (1901, No. 2) announces that an important expedition is being organized in Holland for the exploration of the little-known interior of Dutch Guiana. The project is supported by two Dutch colonial societies, as well as by the Royal Netherlands Geographical Society, each of the three bodies being represented on a committee, which has been formed for the carrying out of the necessary arrangements. The expedition will be commanded by L. A. Bakhuis, late of the Topographical Service of the Netherlands Indies, who acted as topographer to the Sumatra expedition of J. W. Ijzerman in 1890. It is expected that W. L. Loth, well known as a traveller and surveyor in Surinam, will also take part in the expedition, which may also include a botanist. The sphere of action will probably be the basin of the Kopename, the principal river of Central Surinam, which is at present very little known. A start will be made from the Raleigh falls, and the course of the river will be followed southward to the mountainous region in which it rises.

POLAR REGIONS.

The Degree-measurement in Spitsbergen.—Recent numbers of *Ymer* (Nos. 2 and 3, 1900) contain some accounts of the Russo-Swedish operations for the measurement of an arc of the meridian in Spitsbergen, though full details have not yet been published. The first paper, by V. Carlheim-Gyllensköld, gives a general account of the work, especially that performed by the Swedish party which had its headquarters at Treurenberg bay. This began with the careful measurement of a

base-line (August 12 to 23, 1899). The subsequent observation of angles was much impeded by the weather, and little had been done in this direction before the sailing of the *Svenskund* on September 14. Some topographical work had, however, been accomplished, both in the neighbourhood of Murchison bay and Mount Celsius (where determination of latitude and azimuth were made), and in that of Lady Franklin bay and Capes Hansteen and Hekla. Geographically, the most interesting work was the attempt made by Rubin and Fraenkel to reach Mount Chydenius from East fiord, the eastern arm of Wijde bay. The route lay south-east, up a great glacier which flowed between steep inaccessible cliffs, while the surface was at times so broken as to render it exceedingly difficult to make any way with the sledges. Constant fog also prevailed, making it impossible for the most part to obtain any distant views which might have thrown light on the geography of the country. On the third day, after reaching an altitude of some 2650 feet, the travellers left their sledge and tent and ascended a pass to the south (8960 feet), from the summit of which a break in the mist allowed a glimpse of the surrounding country. To the east lay a seemingly impassable range, forming the western limit of the inland ice, and apparently including the summit named Chydenius, when seen from the opposite direction. A pyramidal peak was seen to the south-west, and another high summit to the south-east; but, the weather being still unpropitious, it was decided to return. The furthest point reached was placed by dead reckoning in $79^{\circ} 6' 5''$ N., $16^{\circ} 58' 9''$ E. The second paper, a translation of which has been kindly placed at our disposal by the Hydrographer to the Admiralty, is by Gerard de Geer, the Swedish representative with the Russian party under T. H. Chernicheff, and outlines the work done in southern Spitsbergen in the summer of 1899. The first part of the paper describes the selection of the winter station at Goës harbour, near the south side of Horn sound, and the unavailing attempts to push northward to the Swedish station. The failure of these is ascribed in great measure to the reluctance of the ice-pilots to take the ship into the belts of drift-ice, which they erroneously took for heavy pack, the coasts of Spitsbergen being, as a matter of fact, particularly free from ice during that season. Meanwhile, the surveyors were busy with the erection of signals at various points around the Stor fiord, their operations being, however, much hampered by the fogs and cloud-caps on the mountains. It rarely happened that all the signals were visible at the same time, for the winds which cleared the clouds from the summits on one side of the fiord would blow as a sea-wind on the other, and so induce the formation of clouds. The thickest fogs and heaviest rain occurred near the mouth of the Stor fiord, while the country inland from Ice fiord and Bell sound showed by its richer vegetation and less developed glaciers that it enjoyed a greater amount of sunshine. The reconnaissances made during the early summer showed the advisability of a modification of the original plan for the connection of the northern and southern surveys. In place of the snow-clad Hvitaberg (White mountain) it was found more suitable to choose either Mount Hellwald or Mount Steinhauser, while the difficulties of access to Mount Chydenius—not one, but a whole series of mountain summits—rendered it doubtful whether or not a signal could be erected on it. The discovery that the Svansberg, placed on the older charts near the coast, is in reality 9 miles further inland, and the only dominating summit in this part of the island, led to its choice as a connecting station, and Herr de Geer gives an interesting account of an expedition led by him to its summit for the purpose of fixing up a signal. The starting-point was the extremity of the vast glacier which forms the termination of the Stor fiord on the north-west, and the route lay at first over very rough ice. The altitude of the ice-sheet near the southern end of the Svansberg, from which the ascent was begun, was about 1880 feet, and the southern extremity

of the summit plateau, in part covered by an ice-cap, about 3200 feet. The temperature here varied from 24° to 28° Fahr. A beacon was built up of stone found on the summit, and, as was learnt afterwards, observed almost immediately by the Russians stationed on Cape Lee. The mountain proved to lie nearer Ice fiord (Klas Billen bay) than Stor fiord, so that in future its ascent could be more easily effected from the west. The writer makes a detailed statement of the scientific results of the operations of 1899, which included, in addition to the careful mapping of large areas, important geological observations, permitting for the first time the construction of a geological section across the island, showing the limits of the Trias, Carboniferous, and Silurian formations.

A New Plan for reaching the North Pole.—The latest project for the attainment of the north pole is one brought forward by Herr Anschütz-Kämpfe, of Munich, who has adopted and made his own an idea first mooted some years ago in Sweden, that the pole may be reached by means of a submarine boat passing *under* the ice of the arctic ocean. The projector, for whom such a vessel is now being built by German engineers at Wilhelmshaven, lately described his plans at a meeting of the Vienna Geographical Society. The main factors affecting the practicability of the scheme are—firstly, the extent of the separate ice-fields in the polar sea; and, secondly, the depth below the surface to which the ice reaches. From extensive study, as well as personal observation, the lecturer had arrived at the conclusion that the average maximum depth of the pack-ice may be taken to be 80 feet, while the mean thickness does not exceed 16 to 20 feet. Land-ice, reaching, in the form of icebergs, a depth below water of several hundred feet, may, he thinks, from its virtual absence from the seas in question, be left out of consideration, while our present knowledge of the depths attained by the polar basin justifies the opinion that reefs of rock rising towards the surface of the ocean are not to be expected. The proposed vessel will be capable of descending to a depth of 160 feet, at which it will be entirely removed from the influence of cold, storms, and ice-pressure, and the way to the pole will be therefore open. The length of time during which it will be able to remain below the surface is calculated at a maximum of fifteen hours, which, at the modest rate of 3 knots, allows it to cover a distance of some 50 miles, whereas the combined experience of polar voyagers shows that continuous fields of pack-ice never exceed a maximum diameter of about 3 English miles. In the improbable case of no opening being met with within the fifteen hours, there remains the possibility of opening a way by blasting at a weak point in the ice, to be indicated without possibility of mistake by the help of the manometer. The risk of injury by collision will be minimized, not only by the slow rate of motion, but by the great power of resistance to be possessed by the ship, and indispensable on account of the great pressure to which it will be subject from the water. Its form will be that of an ellipsoid of rotation, with a major axis of 70 feet and a breadth of 26 feet, giving a displacement of 800 tons. To obviate rolling, the centre of gravity will be placed as low as possible. The capacity of the interior will be 3500 cubic feet, which allows sufficient air for five men for fifteen hours, the carbonic acid evolved being removed by combination with caustic soda. Propulsion will be effected by horizontal and vertical screws, the former of 40, the latter of 5, horse-power, this last being sufficient to counteract the tendency to rise; while the motive power is to be supplied by a petroleum motor through the medium of a 220 volt accumulator. One hundred and fifty tons of petroleum will be taken, or more than ten times the quantity needed for the 600-mile voyage to the pole from Spitzbergen, to which, or rather to the edge of the ice, the submarine boat will be towed. On arrival at the pack, the direction of the first open water will be taken by the compass, and, the

boat being submerged, a course will be steered for it. If, after an hour or so, the light shows that an opening has been reached, the vertical screw will be stopped, and the boat will rise by its own buoyancy, and, in case of a wide opening, or channel leading northwards, the voyage will be continued on the surface, giving an opportunity for scientific work. Supposing no gleam of light appears when six hours have elapsed, an ascent to the lower surface of the ice will be made with caution, and the voyage continued slowly until, by the reading of the manometer, it is found that a thin place has been reached. Here attempts will be made by blasting to effect an opening, which, however small, will be sufficient to supply air for another fifteen hours; while, in case of failure, there will still be time to return to the last opening that has been left, whence the voyage will be prosecuted in a slightly different direction. But both the assumptions made—that of an uninterrupted ice-field more than 18 nautical miles in diameter, and of one so continuously thick as to defy all efforts at disruption, are entirely contradicted by all previous experience.

Ice in the Arctic Seas, 1900.—The Danish Meteorological Institute has recently issued its report on the state of the ice in the arctic seas during 1900, prepared by Mr. V. Garde. As in former years, the institute has derived its information from captains of ships and others, being greatly assisted in the matter by the co-operation of other meteorological bodies. The results for 1900 are given for (1) the seas round Spitsbergen and Novaya Zemlya; (2) Greenland sea and Denmark strait; (3) Davis strait and Baffin bay; (4) Hudson strait and Labrador; and (5) Bering Sea. The general results may be summarized as follows: Great masses of ice were present in the north-western part of Barents sea and round Spitsbergen, as also in the Kara sea; less ice than usual between Franz Josef Land and Novaya Zemlya and under the east coast of Greenland; normal conditions under south-west Greenland, and particularly favourable conditions under Labrador and in Baffin bay. Heavy masses of ice apparently existed in the neighbourhood of Smith sound. The season 1900 is pointed out as greatly resembling that of 1899; Spitsbergen, however, was more blocked by ice than in that year. A series of maps, showing the distribution of ice in the seas east and west of Greenland during the months of March, April, May, June, July, and August, 1900, illustrates the report.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Classification of Climates.—Dr. Köppen has recently published a most important paper on the geography of climate. He starts with De Candolle's divisions of the world into seven thermal realms, one A megathermic, two C mesothermic, two D microthermic, two E hekistothermic, with two B xerophilic in the western and warmer parts of the globe where there are long droughts and great ranges of temperature. The boundaries between A and the two C's are the isotherms of 18° C. for the coldest month, between the C's and D's 22° C. for the warmest month, and between the D's and E's 10° C. for the warmest month; while the xerophilic regions are those where the relative humidity is under 36 per cent., and the quotient of the monthly rainfall in millimetres by the pressure of saturated vapour at the mean monthly temperature also in millimetres is 3, which practically means a rainfall probability of 0.36. Each of these realms is further subdivided. A.—The Megathermic realm may be subdivided by the isohyet of 30 millimetres in the driest month into A1, the equatorial region of lianas, Mr. Scott-Elliot's "wet jungles," with no rainy season or with a yearly precipitation of over 2000 millimetres. This reaches to the tropics only on the east coast, and is separated from them in the centre and west of the continents by A2, the baobab regions, or tropical savanas, with at least two dry months and less than 2000 millimetres of rain. B.—In the Xerophilic realm the rainfall

cannot be used alone to determine subdivisions, and the number of rainy days is more important. The subdivisions, as well as the exterior boundary of the realm, are determined by relative humidity and the quotients just mentioned. The west coastal strips are exceptions as regards humidity, for they are characterized by heavy dews, and vegetation of the *Welwitschia* type, and Dr. Köppen calls them B1, the garúa regions. At about lat. 40° the isotherm for the coldest month divides the Xerophilic realm into two. In the regions of milder winters, B3, that next the savanas, has heavy if rare thunder-storms in summer. It is a region of shrubs, and may be called the espinal or mezquite region. Farther from the equator is B2, the desert region, with great temperature changes and extremely rare showers. The date palm and the simum are characteristic. They are also found in B4, the tragacanth region, with a sub-tropical climate, rainless summer and cool winter with occasional rains. The regions with colder winters may be divided into B6, that of the buran, with the saxaul as characteristic plant, where the coldest month is under the freezing-point, and violent snowstorms occur in winter. It is surrounded by B7, the true prairie or steppe climate, which has equally severe winters, but has summer rain. B5, east Patagonia, is an exceptional climatic region, forming a link between the sub-tropical steppes and the tundra of higher latitudes. C.—The Mesothermic or true temperate climatic realm. Three sub-realms are to be distinguished. i. The eastern sub-tropical climate, with hot and rainy summers, and winters varying from cool to cold subdivided into C1, the camelia region with mild winters, whose coldest month is not lower than 2° C.; C2, the hickory region, where the winters are cold and long; and C3, the maize region, with a short if somewhat cold winter and a distinct dry period in late summer, a region intermediate to B7 and C4. ii. The classical sub-tropical region, with mild and moist winters and dry summers, the winter temperature being over 2° C. This is divided into two regions—C4, that of the olive, with a very hot and dry summer; and C5, that of the erica, where the summer is considerably cooler. iii. Beyond the region with the warmest month at 22° C. is a sub-realm which must be included in the Mesothermic realm, with the coldest month not lower than 6° C., the range of temperature small, and no dry period in summer. It is divided into C6, the fuchsia region, with rain at most seasons, or with a short dry period, but having a large total annual rainfall, at least 30 millimetres being precipitated in the driest month; and C7, the upland savana region, with a marked dry season in winter and spring, and with heavy thunderstorms in summer, often with rain and snow. Here the flowers bloom in the late summer. This is the region of the puna. It is distinguished from A2 by its greater coolness at all periods of the year, and from B3 by its lower summer temperature and greater rainfall. D.—The Microthermic or cool temperate realm is divided by the line where four months at least have a temperature of 10° C., into D1, the oak climate, and D2, the birch climate. D3 is the climate of the antarctic beech, with a range of less than 10° C., a maximum monthly temperature of 16° C., and a minimum of at least 0° C., while rain falls at all seasons. E.—The Hekistothermic realm may be divided into four different regions. E1 is that of the arctic tundra or arctic fox, with great extremes of temperature, and cold and relatively dry winters. E2, the antarctic or penguin region, has a small range of temperature and much rain at all periods. E3, the Pamir or Yak region, has a continental climate of great temperature ranges and radiation and slight rainfall. E4, the Alpine region, has small ranges of temperature and much rain. F is the realm of constant frost, where the mean temperature of the warmest month is under the freezing-point, and no vegetation grows. The vegetation period is constant in A1; it occurs during the rainy season in A2; it is changeable in B2; it falls in winter in B1; it happens in spring in B4, B6, B7, C3, C4, and C5; and in all the other regions it comes in summer.

British Pilot Chart of the North Atlantic.—We have received a copy of the specimen issue for January, 1901, of the Pilot Chart of the North Atlantic and the Mediterranean, which is to be published monthly by the Meteorological Council from April next. The main chart has the same boundaries as the United States pilot chart, but is on a somewhat smaller scale, and an inset map contains information for the eastern Mediterranean. The following are the principal data laid down, information relating to atmospheric phenomena being printed in black, that relating to the sea in blue: the direction, and in most cases also the force, of the wind for 5° squares and at a number of land-stations; the limits of the trade winds, and the average southern limit of the region in which gales exceed 10 per cent. of the wind observations; the mean tracks of cyclones for the month; the distribution of fog and ice. The trans-Atlantic steamer tracks and the outward and homeward sailing-routes to the equator are shown, and a large amount of letterpress containing information for the convenience of navigators is added. It is to be hoped that this Pilot Chart, and that now issued by the Deutsche Seewarte, will largely increase the interest taken by commanders and officers of ships sailing from this side of the Atlantic in the collection of meteorological information, which they alone have the opportunity of extending, and which is of the greatest value both to themselves and to science.

OBITUARY.

George Mercier Dawson, C.M.G., LL.D., F.R.S.

WE have to announce with deep regret the death of our distinguished gold medalist Dr. George M. Dawson, Director of the Geological Survey of Canada, which took place at Ottawa, on March 2, after a short illness.

George Dawson was the son of the late Sir J. William Dawson, the well-known Canadian geologist and Principal of McGill University, Montreal, and was born at Pictou, Nova Scotia, on August 1, 1849. The love of natural science, and particularly of geology, proved to be hereditary, and without disparagement to the great abilities of the father, it may be said that the son surpassed him in his own special studies.

Although handicapped by difficulties that would have broken the spirit and embittered the heart of most men, George Dawson applied himself to study with a devotion and enthusiasm that ensured success in every department, while the geniality of his nature and the unselfish generosity with which he assisted his fellow-workers will remain as a cherished memory with all who knew him.

After attending the classes of the McGill University in Montreal, and deciding to take up geology as his special subject, Dawson came to London in 1869, and went through the three-years' course at the Royal School of Mines with high distinction. Returning to Canada, he proceeded to put his training to use, both by making mining surveys in Nova Scotia and by lecturing at Quebec. The Boundary Commission charged with fixing and marking out on the ground the 49th parallel from the Lake of the Woods to the Rocky Mountains, across the then almost unknown prairies, appointed him as geologist and botanist in 1873, and for two years he was engaged in exploring work, which was exactly to his mind. Intimate acquaintance with a vast stretch of country, including some of the most featureless and monotonous regions on the face of the Earth, quickened the powers of observation to a remarkable degree. In the general natural history observations also Dawson had an opportunity of recognizing the mutual dependence of all the phenomena which can be studied in the field, and thus he early acquired

broad views of geography which prevented him from ever falling into the narrower modes of thought of a specializing geologist. A voluminous report on the geology and resources of the country on the southern edge of western Canada was the permanent result of these two years' work.

Immediately afterwards Dawson was appointed to a post on the Dominion Geological and Natural History Survey, a service that has trained many able travellers.

The work in which he made his name as a geologist and as a traveller was the preliminary survey of the extreme western province and territories of the Dominion, from the international frontier to the Arctic Sea. Here he was a pioneer of geographical discovery as well as of geological investigation. His journeys were on a heroic scale, including many thousand miles of canoe travelling; and the comprehensiveness of the work done can only be realized from the official reports which were regularly published in the annual volumes issued by the survey. How wide and clear his views of the structure of Canada were may be best judged from the short but singularly luminous chapter on the physical geography of the Dominion, published in the 'Handbook' for the British Association meeting at Toronto in 1897. We know no better geographical description of any region, whether we consider the profound personal knowledge it displays or its clear and cautious generalizations.

The explorations of the Yukon district, which Dr. Dawson commenced in 1887, was the prelude to the development of the great mineral resources of that region; and his name has very appropriately been given to the chief centre of its mining activity. It illustrates the modesty of the man to recall that Dr. Dawson would never acknowledge that the town was named after him; when pressed with a direct question on one occasion, he said, "I think it must have been after some other Dawson, there are so many Dawsons in Canada!"

In 1892, Dr. Dawson was one of the commissioners appointed to investigate the question of seal-life in Bering Sea, with reference to the arbitration proceedings with the United States; and for his services in this matter he was made a C.M.G., and received the thanks of the Canadian Government. Other honours came to him in full measure, honorary degrees from the Canadian universities, and the presidency of the Royal Society of Canada, and of the Geological Section of the British Association, the gold medals of the Geological and of the Royal Geographical Societies, and the Fellowship of the Royal Society. In 1894, on the retirement of Dr. A. R. C. Selwyn, Dr. Dawson was promoted to be the Director of the Canadian Geological Survey. During his tenure of that office, he did all in his power to encourage his staff to undertake journeys of exploration, and the numerous papers published in our recent volumes by members of the Canadian Survey show how heartily the encouragement was responded to.

During the meeting of the British Association at Toronto in 1897, Dr. Dawson was indefatigable in helping the numerous visitors from Europe to make the most of their opportunities in seeing Canada. He himself accompanied one fortunate party across the continent in the special railway car *Chaudière*, and none who were privileged to take part in that memorable trip can ever forget the kindness he displayed. No question was asked by the most learned geologists of the party that could not be answered in a moment, backed with references to the Reports which dealt with the matter; no illustrative section, typical tree, or animal escaped observation; and there was no detail as to personal comfort too trifling to escape his anxious attention.

Dr. Dawson's whole life was a remarkable instance of entire devotion to duty, to the promotion of his chosen science, and to the welfare of the great Dominion whose resources he did so much to discover and render available.

CORRESPONDENCE.

The Rediscovery of Bariloche Pass.

IN the February issue of the *Journal*, Señor Francisco P. Moreno labels as "incorrect" the statement published in the *Globus*, vol. 78, p. 182, *Petermanns Mitteilungen*, 1900, p. 218, and the *Geographical Journal*, vol. xvii. p. 79, as to the Bariloche (or more correctly Buriloche) pass having recently and finally been rediscovered by the Chilian Captain Arturo Barrios C. He further affirms that his own assistants effected this rediscovery in 1898, and brought back in proof of it photographs of both slopes of the gap.

The statement as formerly published is, however, perfectly correct. I do not dispute the existence of the gap called Bariloche on the Argentine "Evidence" maps ($41^{\circ} 24' 30''$ S. lat., $71^{\circ} 54' 30''$ W. long.), but I am in position to prove that this gap does not lie on the old "Buriloche track." In the first place, it is not situated, as it appears on said maps, at the headwaters of Cochamó, as several parallel valleys and a lake (the real "Vidal Gormáz," as named by Christie) belonging to the Manso basin interpose. The want of room for these valleys on the Argentine map shows that no Argentine party has explored this region, and consequently cannot have ascertained whether the track lies there or not.

On the other side, the recent discovery on our part of an easily accessible pass near south of Tronador dispels any doubt as to the identification of the old track at the very place where the historical evidence led us to expect to find it.

The famous *Buriloche track* ("camino tan nombrado de Buriloche") of the Jesuit Father Olivares may be said now to have been re-explored in its entirety from Ralun, its true starting-point, at the northern extremity of the Reloncaví inlet, through Cayutúe, Rio Concha, Rio Blanco, and Buriloche valley to Lake Nahuelhuapi, the extent of the whole track being about 120 kilometres, of which only about 6 or 7 kilometres were explored in 1880 by Señor Moreno. An Argentine Commission penetrated, it is true, in 1898, by Lake Mascardi as far as its north-western extremity, where the path lies, but they do not seem to have discovered it, as they now claim to have found it so far from its true place. Meanwhile large sections of the Buriloche track, that had already been explored on the Chilian side at the end of the eighteenth century by Father Menendez, were re-explored by Señores Christie and Valverde in 1884 and 1885. Señor Fischer, in 1894, tried to find an easier path through the Cochamó valley, and partially succeeded; he re-explored this valley and two intermediate tributaries to the Rio Manso in 1898. Finally, in March and April, 1900, Captain Barrios, who was attached to the Chilian Boundary Commission, entering by the well-tracked path of the Cochamó valley, turned northward by the Rio Valverde, crossed over to the Rio Blanco basin by Rio Esperanza, identified the thermal waters of Buriloche, where Father Menendez camped on February 21, 1791, and passed over to the Buriloche or Rio Barros-Arana basin by a "low, wide, and easy pass" that we have called "Barrios pass," lying only 8 kilometres to the south of the summit of the gigantic Tronador, $41^{\circ} 13' 30''$ S. lat. Between the north-western and north-eastern branches of Lake Mascardi, Captain Barrios made a short cut by an old track, reached the continental divide at "Mascardi pass," and from this point, an extent of only 25 kilometres, by the Argentine track, the shores of Nahuelhuapi, where he arrived on April 28.

Thus the different valleys and passes through which the Buriloche track lies have been successively explored and identified by two Chilian explorers: from Ralun to the Rio Blanco valley nearly as far as the thermal waters by Captain Valverde in 1885; and from this place as far as Nahuelhuapi by Captain Barrios

in 1900. Of the whole track only about the fifth part has actually been explored by Argentine parties; two-thirds of the valleys referred to are unknown to them, and the very existence of an accessible pass in the immediate vicinity of the Tronador is denied in the Argentine papers referred to by Señor Moreno.

The distinctive feature of the Buriloche track is the avoidance of any lake-crossing, there being no doubt that its reopening as a cattle-track would prove profitable to Chile as well as to Argentina.

More detailed information on this question will be found in the text as well as on the maps that are shortly to be submitted to the Arbitration Tribunal for solution of the boundary question, on the side of Chile.

ALEJANDRO BERTRAND.

London, February 16, 1901.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Seventh Ordinary Meeting, February 25, 1901.—Sir T. H. HOLDICH, R.E.,
K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*George Atkinson; D. Ronald Buchan; Captain Bruce Kingsmill, R.A.; Heneage Gibbes Wheeler.*

The Paper read was:—

“Some Aspects of South American Geography.” By Colonel George Earl Church.

Eighth Ordinary Meeting, March 11, 1901.—Sir T. H. HOLDICH, R.E.,
K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*James Henry Booth; S. H. Brooks; Captain Percy Harrison Fawcett, Royal Garrison Artillery; Lieut. Rowland Gibson, Dorset Regiment; Henry Hibbert; Charles Phodore Jacoby; Charles Lewall; William Glendowes Mackenzie; A. D. Milne, M.B., C.M., Uganda Medical Staff; Harry Nuttall; John Parkinson, F.G.S.; Lester Ralph; Granville H. Ramage; Robert Graham Rogerson, C.E.; William H. Williams.*

MR. FREDERICK PULLAR.

The CHAIRMAN said: It is with regret that I have to announce the death of one of our members, Mr. Frederick Pullar, who you may possibly remember has, conjointly with Sir John Murray, contributed papers to the *Journal* of the Society on the Highland lochs of Scotland. It is, perhaps, with a melancholy sense of the fitness of things that we have to recall that he found his death in one of his own beloved lochs, while gallantly attempting to save the life of a young lady who had fallen through the ice. His memory is one which I am sure the Society will always honour. He was a brave man, and he will always be remembered by us, not only for his own personal worth and bravery, but as a most valuable contributor to the pages of our *Journal*.

The Paper read was:—

“The Geography of the North-West Frontier of India.” By Sir Thomas H. Holdich, R.E., K.C.I.E., C.B.

GEOGRAPHICAL LITERATURE OF THE MONTH.

*Additions to the Library.*By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.	Mag. = Magazine.
Abh. = Abhandlungen.	Mem. = Memoirs, Mémoires.
Ann. = Annals, Annales, Annalen.	Met. = Meteorological.
B. = Bulletin, Bollettino, Boletim.	P. = Proceedings.
Com. = Commerce.	R. = Royal.
C. Rd. = Comptes Rendus.	Rev. = Review, Revue.
Erdk. = Erdkunde.	S. = Society, Société, Selskab.
G. = Geography, Geographie, Geografia.	Sitzb. = Sitzungsbericht.
Ges. = Gesellschaft.	T. = Transactions.
I. = Institute, Institution.	V. = Verein.
Iz. = Izvestiya.	Verh. = Verhandlungen.
J. = Journal.	W. = Wissenschaft, and compounds.
k. u. k. = kaiserlich und königlich.	Z. = Zeitschrift.
M. = Mitteilungen.	Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Botany. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 8–14. **Wettstein.**
Die wissenschaftlichen Aufgaben alpiner Versuchsgärten. Von Prof. Dr. R. v. Wettstein.

Alps of Carinthia. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 362–394. **Steinitzer.**
Die Carnischen Voralpen. Von H. Steinitzer. *With Map and Illustrations.*

A general account of the Carnic Alps, with notes on their physical and human geography.

Alps—Föhn. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 61–79. **Klein.**
Der Nordföhn zu Tragöss. Ein Beitrag zur Wetterkunde der Ostalpen. Von Dr. Robert Klein. *With Map and Illustration.*

Alps—Ifen. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 52–60. **Eckert.**
Das Gottesackerplateau (ein Karrenfeld) in der Gebirgsgruppe des Hohen Ifen. Von Dr. Max Eckert.

Alps—Orography. *B.S.G. Italiana* 1 (1900): 776–813, 873–928, 984–1006. **Marinelli.**
Studi orografici nelle Alpi Orientali. Del Prof. Olinto Marinelli. *Illustr.*

Alps—Pitzthal. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 110–136. **Schucht.**
Das Pitzthal. Von Richard Schucht. *With Illustrations.*

Alps—Rhätikon. *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 42–51. **Rothpletz.**
Geologische Wanderungen im Rhätikon. Von A. Rothpletz.

Alps—Sella group. **Bindel.**
Z. Deutsch. u. Österreich. Alpenv. 30 (1899): 359–400; 31 (1900): 324–361.
Die Sellagruppe. Von Dr. Karl Bindel. *With Map and Illustrations.*

This profusely illustrated monograph does not appeal only to tourists, but deals with the Sella group from the points of view of geology, orography, hydrography, flora, ethnography, etc., and ends with a full bibliography.

Alps—Sonnblick. **Machaček.**
Zur Klimatologie der Gletscherregion der Sonnblickgruppe. Von Dr. Fritz Machaček. (Aus dem achten Jahres-Berichte des Sonnblick-Vereines für das Jahr 1899.) Size 11½ × 7½, pp. 34. *Diagrams. Presented by the Author.*

- Alps—Structure.** *Nature* 63 (1901): 294–296. Ogilvie-Gordon.
 An Alpine Crust-Basin. By Dr. Maria M. Ogilvie-Gordon.
 Review of two works by Prof. Rothpletz, dealing with the boundary district between the Eastern and Western Alps.
- Alps of Tirol.** *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 300–323. Christomannos.
 Die Latemargruppe. Von Dr. Th. Christomannos. *With Map and Illustrations.*
 The Latemar group, here described in detail, lies nearly due north of Predazzo, in the Tirol.
- Alps—Zugspitze.** *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 1–7. Burkhard.
 Das Observatorium auf der Zugspitze. Von Wilhelm Burkhard. *With Plate.*
- Austria—Aquileja.** *Tour du Monde* 6 (1900): 577–588. Martel.
 Aquileja (Autriche). Par M. E. A. Martel. *With Illustrations.*
 Aquileja, or Aglar, was one of the principal cities of Northern Italy, until destroyed by Attila in 452 A.D.
- Austria—Bohemia.** *Petermanns M.* 46 (1900): 290–292. Uhlig.
 Geologische Karte des Böhmisches Mittelgebirges. Von Prof. Dr. V. Uhlig.
 On the first three sheets, lately issued, of a geological map of the eruptive ranges of Central Bohemia, with text by J. E. Hibsich.
- Austria—Herzegovina.** *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 25–41. Penck.
 Geomorphologische Studien aus der Herzegowina. Von Albrecht Penck. *With Illustrations.*
- Austria-Hungary.** *Z. Ges. Erdk. Berlin* 35 (1900): 286–296. Stavenhagen.
 Ueber das neueste Militär-Kartenwesen Oesterreich-Ungarns. Von W. Stavenhagen.
- Austria—Karst.** *Z. Deutsch. u. Österreich. Alpenv.* 31 (1900): 97–109. Müller.
 Die Kačna jama im Karst bei Divača. Von Friedrich Müller. *With Plan.*
 On the exploration of a portion of the underground course of the Reka.
- Austria—Lakes.** Müllner.
 Die Seen am Reschen-Scheideck. Eine limnologische Studie von Prof. Dr. Johann Müllner. (Geographische Abhandlungen, herausgegeben von Prof. Dr. Albrecht Penck. Band vii.—Heft 1.) Wien: F. Hölzel, 1900. Size 10 × 7½, pp. 46.
Maps and Profiles. Presented by Dr. Penck.
 This will be special'y noticed.
- Belgium.** Raikes.
 Trade, Finances, etc., of Belgium for the year 1899. Foreign Office, Annual No. 2515, 1900. Size 10 × 6½, pp. 26. Price 2d.
- Denmark—Meteorology.**
 Annuaire météorologique pour l'année 1897. Publié par l'Institut météorologique Danois. Deuxième partie (pp. 98).—Ditto 1899. Première partie. Kjøbenhavn: G. E. C. Gad, 1900. Size 14 × 9½, pp. 140.
- Ethnological—Stone implements.** Giglioli.
 Intorno ad alcuni strumenti litici recentemente o tuttora in uso nell' Europa. Nota del Prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxix., Fasc. 3°, 1899.) Size 10 × 7, pp. 12. *Illustrations. Presented by the Author.*
- France.** *C. Rd.* 131 (1900): 1056–1059. Jonquières.
 Note sur le Bois de Boulogne. Par M. Barras. Rapport de M. de Jonquières.
- France—Ain.** Corcelle.
 Géographie du Département de l'Ain. Par M. J. Corcelle. Bourg, 1900. Size 9½ × 6½, pp. 84. *Map, Plan, and Illustrations. Presented by the Author.*
 This is a careful study of the geography of the department of Ain, based on personal investigations. The department, which the writer has traversed in all directions, includes five distinct natural regions or "pays," recognized by popular nomenclature, though somewhat arbitrarily united into one administrative division in 1789.
- France—Sea Fishery.** *G.Z.* 6 (1900): 696–701. Lindeman.
 Die französische Seefischerei. Von Dr. Moritz Lindeman. *Also separate copy, presented by the Author.*

Germany. *Rev. G.* 45 (1899): 401; **Drapeyron.**
46 (1900): 1, 86, 164, 268, 336, 424; 47 (1900): 22, 90, 188, 258, 324, 415.

A travers l'Allemagne du Nord. Par L. Drapeyron.

This paper is intended to illustrate the use of geography for the study of history.

Germany—Brocken. *M.V. Erdk. Halle* (1900): 63–83. **Kirchhoff and Stade.**

Der Brocken als Geisterberg. Von Prof. Dr. A. Kirchhoff.

Winterbilder vom Brocken. Von Dr. H. Stade.

Germany—Elbe. *M.V. Erdk. Halle* (1900): 54–62. **Lorenz.**

Die Hydrographie des Elbystems nach G. v. Alvenslebens Topographie. Von Dr. G. Lorenz.

The various passages on the hydrography of the Elbe system contained in Gebhard von Alvensleben's 'Topographie Erzstiftes Magdeburg' (1655), are here collected.

Germany—Prussian Saxony. *M.V. Erdk. Halle* (1900): 22–54. **Schmidt.**

Die Siedelungen an der Hainleite, Schmücke-Schrecke und Finne. Von Dr. M. G. Schmidt.

In this district, which lies between the Harz and Thüringerwald, the separate periods of settlement within historic times can be distinguished by the characteristic terminations of the place-names.

Germany—Silesia. *Globus* 78 (1900): 297–300, 321–325, 338–342. **Tetzner.**

Die Tschechen und Mährer in Schlesien. Von Dr. F. Tetzner. *With Illustrations.*

Germany—Thüringerwald. *M.V. Erdk. Halle* (1900): 1–22. **Gerbing.**

Die frühere Verteilung von Laub- und Nadelwald im Thüringerwald. Von Luise Gerbing. *With Map.*

With a gradual extension of coniferous at the expense of deciduous forests in many districts—an extension likely to be carried yet further in the future—the author thinks that no radical change can be traced within historic times. See *ante*, p. 426.

Germany—Thuringia. *M.V. Erdk. Halle* (1900): 83–87. **Toepfer.**

Phänologische Beobachtungen in Thüringen 1899. Von Dr. H. Toepfer.

Statistics of dates of blossoming, fruiting, etc., for forty-one species of trees and shrubs at six different stations.

Germany—Württemberg. **Rose.**

Trade, Agriculture, and Finances of Württemberg for the year 1899 and part of 1900. Foreign Office, Annual No. 2532, 1900. Size $9\frac{1}{2} \times 6$, pp. 38. Price 2½d.

Greece—Earthquakes. *Petermanns M.* 46 (1900): 277–284. **Mitzopulos.**

Die Erdbeben von Tripolis und Triphyllia in den Jahren 1898 und 1899. Von Prof. C. Mitzopulos. *With Map and Plan.*

Holland—Diluvium. **Cappelle.**

Verh. K.A. Wetens. Amsterdam (2 Sec.) 7, No. 3 (1900): pp. 26.

Mededeelingen omtrent de Geologie van Nederland, verzameld door de Commissie voor het geologisch onderzoek. No. 27. Nieuwe waarnemingen op het Nederlandsche diluviaalgebied, voornamelijk met het oog op de kaartteering dezer gronden. (II.) Door H. van Cappelle. *With Map.*

This treats of the moraine deposits, heath-sand, and loess of the Veluwe district in North Guelderland.

Iceland. **Vidalin.**

Trade of Iceland for the years 1897–99. Foreign Office, Annual No. 2530, 1900. Size $10 \times 6\frac{1}{2}$, pp. 20. Price 1½d.

Italy—Sicily. **Garston.**

Trade of Sicily for the year 1899. Foreign Office, Annual No. 2529, 1900. Size 10×6 , pp. 66. Price 3½d.

British shipping is being gradually superseded at Palermo by foreign vessels, except where, as in the carrying trade to America, large vessels are required.

Mediterranean—Cyprus. *G.Z.* 6 (1900): 679–696. **Maas.**

Cypern von heute. Von Dr. Otto Maas.

An instructive sketch of the physical and social conditions of Cyprus. The author recognizes the difficulties which the British administration has had to face, and gives on the whole an encouraging picture of progress.

Mediterranean—Cyprus. *J.R. United Service I.* 44 (1900): 1438–1449. **Prinsep.**

A Journey in Cyprus, 1899. By Major D. G. Prinsep. *With Illustrations.*

Northern Europe.**Du Chaillu.**

The Land of the Long Night. By Paul Du Chaillu. London: John Murray, 1900. Size $8\frac{1}{2} \times 6$, pp. xviii. and 266. *Illustrations.* Price 7s. 6d. *Presented by the Publisher.*

In this volume the author tells, in his own inimitable style, the story of his winter wanderings in the far north, for the special benefit of young people.

Norway—Climate.

Climate [of Norway]. [Reprint from Norway (Official Publication for the Paris Exhibition, 1900).] Size 10×7 , pp. [14]. *Map.*

Norway—Fishery and Marine Investigations.**Hjort.**

Report on Norwegian Fishery and Marine Investigations. Vol. i. Edited by Johan Hjort. Kristiania: Oscar Andersens Bogtrykkeri, 1900. Size $11 \times 7\frac{1}{2}$, pp. 214, 56, 42, 46, 30, 92, xxxviii., 14, 58, and 24. *Maps and Plates.* *Presented by the Editor.*

Norway—Meteorology.**Mohn.**

Jahrbuch des Norwegischen Meteorologischen Instituts für 1899. Herausgegeben von Dr. H. Mohn. Christiania, 1900. Size $13\frac{1}{2} \times 10\frac{1}{2}$, pp. xii. and 122.

River Systems.*Petermanns M.* 46 (1900): 167-170, 192-194.**Bludau.**

Die Areale der europäischen Stromgebiete. Von Dr. Alois Bludau. III. Die Donaustaaten und die Donau.

Russia—Solovetsk. *P. Philosoph. S. Glasgow* 31 (1900): pp. 67-106.**Mavor.**

A Pilgrimage to Solovetsk. By Sam. Mavor. *Illustrations.* *Also separate copy.* *Presented by the Author.*

Account of a voyage in 1899 to the monastery of Solovetsk, on an island in the White sea, with interesting particulars on the present state of the Murman coast.

Russian Empire.**Kovalevsky.**

Commission Impériale de Russie à l'Exposition Universelle de Paris. La Russie à la fin du 19^e Siècle. Ouvrage publié sous la Direction de M. W. de Kovalevsky. Paris: P. Dupont, 1900. Size $10 \times 6\frac{1}{2}$, pp. xx. and 990. *Maps and Diagrams.* *Presented by M. de Tatistcheff.*

A most valuable account of the present condition of the Russian Empire, its agriculture, industries, commerce, communications, etc., by a large number of experts.

Sailing Directions.*Nautical Mag.* 69 (1900): 747-750.**White.**

'The Rutter of the See.' (By Robert Copland.) With Notes by J. Dundas White.

A brief description of the earliest book on navigation in the English language, with reprint of the prologue. The 'Rutter' was a translation from a French original published at the beginning of the sixteenth century (Mr. White, by a slip, says fifteenth), which is thought by some to have been the work of Pierre Garcie, author of the 'Grant Routier,' which appeared later.

Spain.**Dieulafoy.**

Madame Jane Dieulafoy. Aragon and Valence, Barcelone, Saragosse, Sagonte, Valence. Les Beaux-Arts, les Mœurs, les Coutumes. Paris: Hachette & Cie., 1901. Size $12\frac{1}{2} \times 9$, pp. 148. *Illustrations.* *Presented by the Publishers.*

A profusely illustrated popular account of two of the provinces of Spain, with especial reference to their people and works of art, ancient and modern.

Switzerland.*XVII. Jahresb. G. Ges. Bern* (1898-99): 121-146.**Brückner.**

Die Schweizerische Landschaft einst und jetzt. Von Prof. Dr. Eduard Brückner. On the geological history of Switzerland.

Travel.**Taylor.**

Odd Bits of Travel with Brush and Camera. By Charles M. Taylor, jun. Philadelphia: G. W. Jacobs & Co., 1900. Size $8 \times 5\frac{1}{2}$, pp. 358. *Illustrations.* *Presented by the Author.*

A pleasantly written account of travel in Western Europe, especial attention being given to the old-world towns and villages of Holland and the Rhine. The tints in which the illustrations are printed are not always artistic.

United Kingdom. *Quarterly J. R. Meteorolog. S.* 26 (1900): 113-138.**Mawley.**

Report on the Phenological Observations for 1899. By Edward Mawley. *Map.*

On the dates at which the phenomena of budding, flowering, fruiting, etc., of plants, and the movements of migratory birds, etc., were observed.

United Kingdom.**Yates.**

Collins' School Series. Collins' Alternative Geography Reader. By M. T. Yates, LL.D. Book II.—Standard V. The British Isles. London and Glasgow: W. Collins, Sons, & Co. Size $10 \times 7\frac{1}{2}$, pp. 196. *Maps and Illustrations.* Price 2s. *Presented by the Publishers.*

A distinct advance on many of the readers now in use.

United Kingdom—Egg Supply. *J.R. Agricultural S.* 11 (1900): 605–645.

Brown.

The British Egg Supply. By Edward Brown. *With Illustrations.*

The writer shows the enormous increase of our imports of eggs of late years, and dwells on the need of a revolution in home methods of poultry farming.

United Kingdom—Manchester. *J.R.I. Brit. Architects* 7 (1900): 453–464.

Oakley.

Manchester: Some Notes on its Development. By Frank P. Oakley. *Illustr.*

A comparison of Manchester in 1800 with Manchester in 1900.

United Kingdom—Scotland.**Watt.**

Scottish Forests and Woodlands in Early Historic Times. By H. B. Watt. (Reprinted from *Annals of the Andersonian Naturalists' Society*, vol. ii. part ii. Glasgow, 1900.) Size 9×6 , pp. [20]. *Presented by the Author.*

The author endeavours, from a study of the history of Roman and later times, as well as from topographical and traditional evidence, to estimate the former extent of Scottish woodlands.

ASIA.**China—Mongolia.****Radloff.**

Arbeiten der Orchon-Expedition. Atlas der Alterthümer der Mongolei. Im auftrage der Kaiserlichen Akademie der Wissenschaften herausgegeben von Dr. W. Radloff. Vierte Lieferung. St. Petersburg, 1899. Size $20\frac{1}{2} \times 13\frac{1}{2}$. *Plates.* *Presented by the Academy.*

This instalment consists of photographs of monuments and old Turkish inscriptions from the burial-place on the Tonjukuk.

China—Pe-Chi-li.

Supplement to Short Military Report on the Province of Chi-li. Compiled in the Intelligence Branch of the Quarter-Master General's Department, Simla. I.—A short Note on the Operations of the Allied Forces in Chi-li in 1860. II.—The Operations of the British Cavalry in Chi-li during August and September, 1860. Simla, 1900. Size $10 \times 6\frac{1}{2}$, pp. 8. *Map.*

China—Religions. *Nineteenth Century* 48 (1900): 373–384, 569–581, 730–742. **Müller.**

The Religions of China. By the Right Hon. Professor Max Müller.

China—Shantung. *Petermanns M.* 46 (1900): 273–277.

Anz.

Durch die Halbinsel Schantung von Tschifu nach Tsingtau 1. bis 6. März 1899. Von Walter Anz. *With Map.*

China—Stone age.**Giglioli.**

L'età della pietra nella Cina colla descrizione di alcuni esemplari nella mia collezione. Appunti di Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxviii., fasc. 3^a, 1898.) Size 10×7 , pp. 20. *Illustrations.* *Presented by the Author.*

India.

Contemporary Rev. 78 (1900): 682–692.

Nash.

An Empire Adrift. By Vaughan Nash.

On the present condition of the Indian ryots.

India—Assam.**Carr-Calthrop.**

Annual Sanitary Report of the Province of Assam for the year 1899. By Colonel C. W. Carr-Calthrop, M.D. Shillong, 1900. $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 38, xxx., and 4. *Maps.*

India—Assam.

Returns of the Rail and River-borne Trade of the Province of Assam for the quarter ending June 30, 1900. Shillong, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 132.

India—Bombay. *J. Bombay Br. R. Asiatic S., Extra Nr.* (1900): pp. 368. **Da Cunha.**

The Origin of Bombay. By J. Gerson da Cunha.

An exhaustive account of Bombay in the Hindu, Portuguese, and British periods.

India—Botanical Survey.

Report of the Director of the Botanical Survey of India for the year 1899-1900.

Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 10.

Among the most interesting botanical work done during the year was a collection by Lieut. Gage from the Lushai country, previously unexplored botanically.

India—Fisheries.**Thurston.**

The Sea Fisheries of Malabar and South Canara. By Edgar Thurston. (Madras Government Museum. Bulletin, vol. iii. No. 2.) Madras, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 93-184. *Illustrations.*

India—Himalayas.**Freshfield.**

Round Kanchinjinga. (From *Country Life Illustrated*, Aug. 25, 1900, pp. 233-239.) Size $15 \times 9\frac{1}{2}$. *Illustrations.*

Extracts from Mr. Freshfield's paper at the Alpine Club, illustrated by selections from the mountain photographs there exhibited.

India—Kashmir.**Francke.**

Ladāker mythologische Volkssagen. Von H. Francke. (Sonder-Abdruck aus Band lxxvi., Nr. 20 des *Globus*, pp. 313-315.) Braunschweig, 1899. Size $12\frac{1}{2} \times 9$.

India—Water Supply. *Imp. and Asiatic Quarterly Rev.* 11 (1901): 35-45. **Sowerby.**

Water-Supply in Mitigation of Drought in India. By William Sowerby.

Indian Ocean—Seychelles.**Escoff.**

Seychelles. Report for 1899. Colonial Reports, Annual No. 301, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 50. *Price 3d.*

The increasing prosperity of the islands is shown by the fact that customs receipts have doubled since 1895. The systematic working of the valuable guano deposits on the Amirantes has been taken in hand.

Japan.**Firth.**

Agriculture and Horse and Cattle Breeding in Kagoshima Prefecture, Japan.

Foreign Office, Miscellaneous, No. 539, 1900. Size $10 \times 6\frac{1}{2}$, pp. 10. *Price 1d.*

The district under review is hilly, and five-sixths of the cultivated area consists of "hata," or upland fields. Of a population of 1,090,000, 500,000 are wholly dependent on agriculture.

Malay Archipelago. *Petermanns M.* 46 (1900): 182-191.**Weber.**

Die niederländische Siboga-Expedition zur Untersuchung der marinen Fauna und Flora des Indischen Archipels und einige ihrer Resultate. Von Prof. Dr. Max Weber.

An abstract of this paper appeared in the *Journal*, vol. xvi. p. 549.

Malay Archipelago.

Tijds. K. Ned. Aard. Genoots. Amsterdam 17 (1900): 427-530.

De Siboga-Expeditie. Door L.

Malay Archipelago—Celebes.**Sarasin.**

XVII. Jahresb. G. Ges. Bern. (1898-99): 65-94.

Ueber unsere Reisen im Innern von Celebes. Von Paul Sarasin. *With Map.*

This paper was read in May, 1898.

Persia.**Temple.**

Trade of Khorassan for the year 1899-1900. Foreign Office, Annual No. 2533, 1900. Size $10 \times 6\frac{1}{2}$, pp. 14. *Price 1d.*

The imports of tea, both from India and Russia, and of sugar from Russia, show a considerable increase. Exports to India are still small, but to Russia are very large. The population of Meshed continues to increase steadily.

Philippine Islands. *National G. Mag.* 11 (1900): 465-470.**Hilder.**

Gold in the Philippines. By F. F. Hilder.

The writer here records information received from reliable sources during a visit to the Philippines in 1900.

Philippine Islands.**Hitchcock.**

Trade of the Philippine Islands. By Frank H. Hitchcock. (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin No. 14.) Washington, 1898. Size $9\frac{1}{2} \times 6$, pp. 160. *Map. Presented by the U.S. Department of Agriculture.*

Siam.**Carlsale.**

Trade of Bangkok and District for the year 1899. Foreign Office, Annual No. 2528, 1900. Size 10 × 6½, pp. 18. Price 1½d.

The total volume of the foreign trade of Bangkok was £5,655,912 in 1899, as compared with £5,913,302 in 1898, the decrease being accounted for by the decreased export and import of treasure.

Russia—Siberia. *XVII. Jahresh. G. Ges. Bern.* (1898-99): 1-63.

Jochelson.

Die Jukagiren im äussersten Nordosten Asiens. Von W. Jochelson. *Illustr.*

Ueber die Sprache und Schrift der Jukagiren. Von W. Jochelson. *Illustr.*

On an aboriginal race dwelling between the Lena and the Stanovoi range.

Russia—Siberia—Railway.

Pariser Weltausstellung d. J. 1900. Die grosse Sibirische Eisenbahn. Herausgegeben von der Kanzlei des Ministercomiters. St. Petersburg, 1900. Size 10½ × 7, pp. 16. *Maps and Portrait.* Price 1s. 6d.

Russia—Transcaucasia. *Z. Deutsch. u. Oesterreich. Alpenr.* 31 (1900): 156-178. **Rickmers.**

Der Kartsch-Chal in Transkaukasien. Von Willy Rickmer-Rickmers. *Illustr.*

The Kartsch-Chal is a mountain group 30 miles from Batum, explored by the author in 1895.

Russia—Trans-Caucasia.**Stevens.**

Agriculture in the Trans-Caucasus, 1900. Foreign Office, Annual No. 2534, 1900. Size 10 × 6, pp. 14. Price 1d.

Agriculture in the Trans-Caucasus is said to be still in a backward state. Among the industries referred to are the cultivation of tea, tobacco, the vine, silk, etc. The silk industry has assumed large proportions during recent years.

Siberia and Manchuria.**Colquhoun.**

J.R. United Service I. 44 (1900): 1408-1430; *Monthly Rev.* (1900): 40-55.

The Great Trans-Siberian-Manchurian Railway. By A. R. Colquhoun. *Maps.*

South-East Asia—Historical.**Gerini.**

Imp. and Asiatic Quarterly Rev. 10 (1900): 365-394; 11 (1901): 155-170.

Siam's Intercourse with China (Seventh to Nineteenth Centuries). By Major G. E. Gerini.

The author brings forward some new facts, based on Chinese records, regarding the early spread of Buddhism in Indo-China.

Turkey—Syria.**Serruys**

Notice sur le Liban. Par Washington Serruys. Beyrouth, 1900. Size 8½ × 6, pp. 46. *Presented by the Author.*

A useful account of the Lebanon in its present condition, with statistics.

AFRICA.

British South Africa. *Contemporary Rev.* 78 (1900): 669-675.

White.

Concerning South African Settlers. By Arnold White.

On the conditions to be fulfilled by schemes for the settlement of South Africa.

Canary Islands.

Globus 78 (1900): 365-370.

Krämer.

Ein Besuch von Gran Canaria. Von Dr. Augustin Krämer. *With Illustrations.*

The visit was made in 1899-1900.

Central Africa.

Mouvement G. 17 (1900): 483-486, 495-498.

Kandt.

Aux frontières du Congo. L'exploration du Dr. Kandt.

An editorial note discusses the question of the source of the Nile, which is held to be the Victoria Nyanza rather than the source of any river flowing into it. The rôle played by the Kagera is perhaps unduly depreciated, for there can be little doubt that, were the lake drained by the wearing down of its barrier, the river would still find its way to the Nile, whereas if the Kagera were diverted from the lake, the latter would soon cease to have an outlet.

Central Sudan. *Imp. and Asiatic Quarterly Rev.* 11 (1901): 82-97.

Edwards.

An African Napoleon. By F. A. Edwards.

Describes the victorious career and final overthrow of Rabeh, or Rabah.

Congo State. *Mouvement G.* 17 (1900): 388-390, 398-401, 413-415, 427-429: ———
 Etat indépendant du Congo. Rapport au Roi-Souverain.
 On the condition and progress of the Congo State in 1900.

Congo State—Katanga. *Mouvement G.* 17 (1900): 601-606. **Wauters.**
 Au Katanga. Par A. J. Wauters. *With Map.*
 A sketch of the recent development of the south-east portion of the Congo state.

Congo State—Navigation. *Mouvement G.* 18 (1901): 1-4. **Wauters.**
 La navigation à vapeur sur le haut Congo. Par A. J. Wauters.

The number of steamers on the upper Congo and its affluents now reaches 103, of which 39 are French, 31 Congo State, 17 Belgian, 10 Dutch, 3 British, 2 German, and 1 American.

Egypt—Oases. **Guest.**
 Report on the Oases of the Mudiriyeh of Assyut. By A. R. Guest. Cairo: National Printing Department, 1900. Size 11 × 7½, pp. 42. *Maps. Presented by the Author.*

An abridged version of this report appeared in the *Journal* for December last.

Egypt—Oases. **Guest.**
 The Oases of the Mudiriyeh of Assyut. By A. R. Guest. (From the *Geographical Journal* for December, 1900.) Size 10 × 6½, pp. 8. *Map and Illustrations.*

Egypt—Public Works Department. **Garstin.**
 Public Works Ministry. Report upon the Administration of the Public Works Department for 1899. By Sir W. E. Garstin, K.C.M.G. With Reports by the officers in charge of the several branches of the Administration. Cairo, 1900. Size 11 × 7½, pp. 324. *Plans and Illustrations. Presented by the Author.*
 This is referred to at p. 307, *ante*.

French Guinea—Futa Jallon. **Machat.**
Renseignements Colon., Comité l'Afrique Française, No. 7 (1900): 125-145.
 Essai sur la géographie du Fouta-Diallon. Par M. J. Machat. *With Map.*

French West Africa. **Hostains and d'Ollone.**
B. Comité l'Afrique Française 10 (1900): 327-332, 382-383, 390-392.
 La mission Hostains-d'Ollone. *With Portraits and Illustrations.*
 Account of the recent French expedition from the Ivory coast to the Sudan.

French West Africa—Niger. *Rev. G.* 47 (1900): 359-373, 436-451. **Lenfant.**
 La flottille du Niger. Notes rapides d'inspection fluviale. Par E. Lenfant. *With Sketch-maps.*

On a reconnaissance in 1899 of the upper and middle Niger, by the officer lately entrusted with the occupation of the French *enclaves* on the lower river.

Gambia. **Llewelyn.**
 Gambia. Report for 1899. Colonial Reports, Annual No. 300, 1900. Size 10 × 6½, pp. 8. *Price ½d.*

In 1899 three-fourths of the total exports, which reached a value of £241,936, went to France, the greater part consisting of ground-nuts. The export of rubber has much decreased owing to the practical extinction of the rubber plants.

German West Africa—Togo. **Canstatt.**
Deutsch. Kolonialzeitung 17 (1900): 551, 578-580.
 Die gewerblichen Erzeugnisse des Togogebiets. Von D. O. Canstatt. *Illustrations.*
 On the native industries of Togoland.

Italian Somali Coast. **Dulio.**
 I Commerci del Benadir. Relazione del comm. E. Dulio. (B. Ministero Affari Esteri, Sept. 1900.) Roma, 1900. Size 9½ × 6½, pp. 32.

Liberia. **Delafose.**
Renseignements Colon., Comité l'Afrique Française, No. 9 (1900): 165-194.
 Un État nègre: La République de Libéria, notice géographique, historique, économique et ethnographique. Par M. Maurice Delafose. *Map and Illustr.*
 A useful summary of our knowledge of Liberia, from personal observation.

Madagascar.**Grandidier.**

Voyage dans le Sud-ouest de Madagascar, Conférence faite à la Société de Géographie le 5 janvier 1900. Par Guillaume Grandidier. Paris, 1900. Size $10 \times 6\frac{1}{2}$, pp. 28. *Map and Illustrations. Presented by the Author.*

On a journey in 1898 from Tulear, on the south-west coast, to Fianarantsoa, on the headwaters of the Mangoka. The map is on the large scale of 1 : 500,000.

Madeira.**Spence.**

Trade of Madeira for the year 1899. Foreign Office, Annual No. 2517, 1900. Size $10 \times 6\frac{1}{2}$, pp. 8. *Price ½d.*

Morocco.*Petermanns M. Ergänzungsheft Nr. 133 (1900): 166.***Fischer.**

Wissenschaftliche Ergebnisse einer Reise im Atlas-Vorlande von Marokko. Von Theobald Fischer. *With Maps and Illustrations.*

Full results of the journey referred to in the *Journal*, xiii. 660, xiv. 209.

Nigeria—Hausa Dictionary.**Robinson and Brooks.**

Dictionary of the Hausa Language. By Charles Henry Robinson, M.A., assisted by W. H. Brooks, B.A. Vol. ii. English-Hausa. Cambridge: the University Press, 1900. Size 9×6 , pp. viii. and 218. *Price 9s. net. Presented by the Royal Niger Co.*

North-East Africa.**Smith.**

An Expedition between Lake Rudolf and the Nile. By Dr. A. Donaldson Smith. (From the *Geographical Journal* for December, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 26. *Map and Illustrations.*

Sahara.*Questions Dipl. et Colon. 10 (1900): 721-742.***Foureau.**

De la Méditerranée au Congo. Par F. Foureau. *With Map.*

A reproduction of M. Foureau's paper at the Paris Geographical Society.

Sierra Leone.**Meagher.**

Sierra Leone. Report for 1899. Colonial Reports, Annual No. 299, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 46. *Price 2½d.*

The trade of Sierra Leone has not yet completely recovered from the late disturbances. The export of palm-kernels shows an increase, but a diminution in the case of most articles from the interior is the result of a diversion of trade to French ports. The transit trade in cotton goods to French Guinea has practically ceased.

Tripoli.**Jago.**

Agriculture and other Natural Resources of Tripoli. Foreign Office, Miscellaneous, No. 527, 1900. Size $10 \times 6\frac{1}{2}$, pp. 26. *Price 2d.*

Begins with a clear sketch of the Physical Features of Tripoli.

West Africa—Boundaries. *Rev. Française 25 (1900): 544-548.***Montell.**

Convention Franco-Espagnole en Afrique. Par M. A. Montell. *With Maps.*

West Africa—Boundaries. *B. Comité l'Afrique Française 10 (1900): 279-280.* —

La Convention de délimitation franco-espagnole. *With Maps.*

NORTH AMERICA.**Canada—French.***Nineteenth Century 48 (1900): 777-784.***Cox.**

French Canada and the Empire. By J. G. Sneed Cox.

Canada—Geological Nomenclature.**Ells.***P. and T.R.S. Canada 5 (1899) (Sec. iv.): 3-38.*

Presidential Address: Canadian Geological Nomenclature. By R. W. Ells, LL.D.

A review of the history of geological nomenclature in Canada, and of the problems awaiting solution.

Canada—Historical. *P. and T.R.S. Canada 5 (1899) (Sec. ii.): 359-421.***Doughty.**

The probable Site of the Battle of the Plains of Abraham. By A. G. Doughty. *With Plans and Illustrations.*

A careful and unbiased discussion of the question of the exact site of the battle which decided the fate of Canada, based on the study of old plans and documents. The author places it between Claire Fontaine Street and de Salaberry Street.

Canada—Historical. *P. and T.R.S. Canada 5* (1899) (Sec. I.): 87-101. **Girouard.**

Une Page sombre de notre Histoire—L'Expédition du Marquis de Denonville.
Par M. le juge Girouard.

On some new documents relating to the expedition of Denonville against the Iroquois, 1687.

Canada—Minerals.

Geological Survey of Canada. Part S, Annual Report, vol. xi. Section of Mineral Statistics and Mines. Annual Report for 1898. Ottawa, 1900. Size $10 \times 6\frac{1}{2}$, pp. 196. *Maps. Presented by the Geological Survey of Canada.*

Canada—New Brunswick.

Ganong.

P. and T.R.S. Canada 5 (1899) (Sec. ii.): 213-357.

A Monograph of Historic Sites in the Province of New Brunswick. By W. F. Ganong. *With Maps and Plans.*

Canada—New Brunswick.

Miller.

New Brunswick, Past and Present. By C. A. Duff Miller. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. 32. *Portrait. Presented by the Author.*

An interesting sketch of the history and present condition of New Brunswick.

Canada—Newfoundland. *Rev. G. 47* (1900): 401-414.

Harrisse.

Découverte et évolution cartographique de Terre-Neuve et des pays circonvoisins, 1497, 1500, 1769. Par Henry Harrisse.

An outline of M. Harrisse's new work, lately published in Paris.

Canada—Notre Dame Mts. *B. American Bureau G. 1* (1900): 275-279.

Dresser.

On the Physical Geography of a Northern Section of the Appalachian Mountain System. By J. A. Dresser.

Written from an educational point of view.

Canada—Nova Scotia. *P. and T.R.S. Canada 5* (1899) (Sec. ii.): 1-197.

Bourinot.

Builders of Nova Scotia: A Historical Review, with an Appendix containing Copies of Rare Documents relating to the Early Days of the Province. By Sir John G. Bourinot, K.C.M.G. *With Portraits and Illustrations.*

Canada—Nova Scotia. *P. and T.R.S. Canada 5* (1899) (Sec. iii.): 23-26.

Dawson.

Illustrations of remarkable Secondary Tidal Undulations, in January 1899, as registered on recording Tide Gauges in the region of Nova Scotia. By W. Bell Dawson. *With Plate.*

Canada—Rocky Mts. *Z. Deutsch. u. Österreich. Alpenv. 31* (1900): 137-155.

Habel.

Aus den Alpen Nordamerikas. Von Jean Habel. *With Illustrations.*

On recent journeys in the source region of the North Fork of the Saskatchewan.

Canada—Trigonometrical Survey.

McLeod.

P. and T.R.S. Canada 5 (1899) (Sec. iii.): 3-7.

A Trigonometrical Survey for Canada; Presidential Address to Section. By Prof. C. H. McLeod.

An appeal for a complete geodetic survey of Canada as an extension of the scheme for the measurement of an arc of 98th meridian.

Canada—Yukon Territory.

Brown.

The Dawson of To-day. By F. F. Brown. (The Yukon Sun, Special Number, September, 1900.) Dawson. Size 11×9 . *Illustrations.*

Canada and United States. *T. Hist. and Sci. S. Manitoba 56* (1900): 14.

Fonseca.

On the St. Paul Trail in the Sixties. By W. G. Fonseca. *With Illustrations.*

The writer describes his experiences as a pioneer on the Red river route from Fort Garry to St. Paul, Minnesota, before the founding of Winnipeg.

Geographical Names. *National G. Mag. 11* (1900): 478-480.

Decisions of the U.S. Board on Geographic Names.

A list of decisions arrived at at the meeting of the board in October last. All have reference to places in the United States and Alaska.

Mexico—Mitla.

Corner.

Mitla: an Archæological Study of the Ancient Ruins and Remains in that Pueblo. By William Corner. [Reprinted from the *Journal of the Anthropological Institute*, August and November, 1899.] London: Harrison & Sons, 1899. Size $11 \times 7\frac{1}{2}$, pp. [24]. *Plates.*

Mexico—Sierra Madre.**Ordoñez.**

Un voyage a la "Sierra Madre del Sur." Par M. Ezequiel Ordoñez. (Memorias de la Sociedad Científica "Antonio Alzate.") Mexico, 1899. Size 9 × 6½, pp. [16].
Presented by the Author.

Mexico—Trade.**Jerome.**

Trade of Mexico for the year 1899. Foreign Office, Annual No. 2527, 1900.
 Size 10 × 6½, pp. 48. *Price 2½d.*

It is a pleasant variation from the story so often told in consular reports to learn that in Mexico travellers for Manchester goods, which almost monopolize the market, show an activity worthy of emulation elsewhere. The chief trade centres in the interior are Merida for the south-east, Mexico city for the south-west, Monterey for the north-east, Guadalajara for the west, and Chihuahua and Guaymas for the north-west. A renewal of activity on the Pacific may be anticipated from the construction of the port of Salina Cruz. The sugar output in 1899 is estimated at 150,000 tons.

Mexico and Guatemala.*Globus* 78 (1900): 389-392.**Sapper.**

Cécilie Selser auf alten Wegen in Mexiko und Guatemala. Von Karl Sapper.
With Illustrations.

Review of Frau Selser's book noticed above, p. 192.

United States.

Annual Reports of the War Department for the fiscal year ended June 30, 1899.
 Report of the Chief of Engineers. 6 vols. Washington, 1899. Size 9½ × 6, pp. xxiv. and 3654. *Maps, Plans, and Illustrations. Presented by the Chief of Engineers, U.S. Army.*

United States—Arid Region. *B. American Bureau G. 1* (1900): 221-233. **Redway.**

The Influence of Rainfall on Commercial Development: a study of the Arid Region. By J. W. Redway.

An instructive study of the influence of physical on human geography as shown by a special case.

United States—Colorado.**Pearce.**

Mining Industry of Colorado. Foreign Office, Miscellaneous, No. 532, 1900.
 Size 9½ × 6, pp. 14. *Price 1d.*

United States—Immigration.**Rossi.**

L'emigrazione Italiana agli Stati Uniti nell'anno 1899-1900. Rapporto del cav. Egisto Rossi. (B. Ministero degli Affari Esteri, Ottobre 1900.) Roma, 1900.
 Size 9½ × 6½, pp. 22.

United States—Meteorology.

Tables of Daily Precipitation at special River and Rainfall Stations of the United States Weather Bureau for the years 1893, 1894, 1895. (U.S. Department of Agriculture, Weather Bureau.) Washington, 1900. Size 10 × 6½, pp. 256.
Presented by the U.S. Department of Agriculture, Weather Bureau.

United States—Montana. *B. American Bureau G. 1* (1900): 280-295.**Holzinger.**

Lake McDonald and Vicinity. By J. M. Holzinger. *With Illustrations.*

A sketch of the physical geography of the neighbourhood of Lake McDonald, from observations during a visit in 1898.

United States—Pacific Coast. *B. American Bureau G. 1* (1900): 135-141. **Fairbanks.**

The Study of Physical Geography upon the Pacific Coast. By H. W. Fairbanks.

United States—Texas—Hurricane. *Monthly Weather Rev.* 28 (1900): 372-377. ———

Special report of the Galveston hurricane of September 8, 1900.

United States—Trade.**Hitchcock.**

Our Foreign Trade in Agricultural Products, 1894-1898. (1899, pp. 46.) Ditto 1890-1899. By Frank H. Hitchcock. (1900, pp. 62.) (U.S. Department of Agriculture. Section of Foreign Markets. Bulletin, Nos. 15 and 19.) Washington. Size 6 × 6. *Presented by the U.S. Department of Agriculture.*

United States—Virginia.**Thom.**

The Struggle for Religious Freedom in Virginia: the Baptists. By W. T. Thom. (Johns Hopkins University Studies in Historical and Political Science. Series xviii. Nos. 10-11-12.) Baltimore, 1900. Size 9½ × 6, pp. 106. *With Map.*

The map is a tracing from the Lewis map prefixed to Jefferson's Notes on Virginia (1794), and shows the distribution of Baptist churches in 1770 and 1774-76.

United States—Wyoming. *National G. Mag.* 11 (1900): 449-465. **Knight.**

The Wyoming Fossil Fields Expedition of July, 1899. By W. C. Knight. *Illustr.*

The expedition referred to had for its objective the Grand Cañon of the Platte, which, Mr. Knight says, had never previously been described. Some good illustrations of it accompany the paper.

CENTRAL AND SOUTH AMERICA.

Brasil—Amazonas.

Giglioli.

Il "Cambarysú" telefono dei Catuquinarú dell' Amazzonia. Nota di Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxviii., fasc. 3^a, 1898.) Size 10 × 7, pp. 4. *Plan. Presented by the Author.*

On the Indian telegraph described in the *Journal* for July, 1898.

Brasil—Goyaz.

Negri.

Lo Stato di Goyaz. Rapporto del cav. E. Negri dei conti di Lamporo. (B. Ministero Affari Esteri. August, 1900.) Roma, 1900. Size 9½ × 6½, pp. 18.

Notes on the State of Goyaz, its productions, financial position, etc.

Chile and Peru.

Salas-Edwards.

The Liquidation of the War on the Pacific. By Ricardo Salas-Edwards. London, 1900. Size 9½ × 6, pp. 56. *Map.*

The writer reviews the circumstances which led to the war between Chile and Peru, and discusses the questions still pending between the two countries, especially the eventual ownership of Tacna and Arica.

Cuba—Census.

War Department, Office Director Census of Cuba. Report on the Census of Cuba, 1899. Washington, 1900. Size 9½ × 6, pp. 786. *Maps, Diagrams, and Illustrations. Presented by the United States Government.*

The full results of the recent census of Cuba, including valuable details on the present state of agriculture in Cuba, as well as on points more nearly related to the enumeration, such as the distribution, occupations, etc., of the population.

Dutch and French Guiana.

Pigott and Wacongne.

Trade of Dutch and French Guiana for the year 1899. Foreign Office, Annual No. 2514, 1900. Size 10 × 6½, pp. 14. *Price 1d.*

The largest share in the import trade into Dutch Guiana is held by the Netherlands, and the next by the United States, while for exports the positions are reversed.

Haiti.

B. American Bureau G. 1 (1900): 249-260.

Powell.

Haiti. By W. F. Powell. *With Illustrations.*

Peru—Mythology.

Quevedo.

Los Ojos de Imaymana y el Señor de la Ventana. Por S. A. Lafone Quevedo, M.A. Buenos Aires, 1900. Size 11 × 7½, pp. 32. *Illustrations.*

On some points of Peruvian mythology suggested by Molina's 'Rites and Laws of the Incas,' published in English by the Hakluyt Society in 1873.

Railway.

Petermanns M. 46 (1900): 173-182.

Sievers.

Die nord-südamerikanische Längsbahn. Von Prof. Dr. W. Sievers. *With Map.*

See note at p. 77, *supra*.

St. Kitts.

Monthly Weather Rev. 28 (1900): 330-333.

Alexander.

Climatology of St. Kitts, W.I. By W. S. Alexander.

Turks and Caicos Islands.

Cameron.

Turks and Caicos Islands. Report for 1899. Colonial Reports, Annual No. 297, 1900. Size 9½ × 6, pp. 22. *Price 1½d.*

The export of salt in 1899 reached a total value of £21,138, and that of sisal grass, which continues to increase steadily, £7493. The sponge industry also shows signs of development. The principal steamers which touch at Grand Turk, apart from the monthly mail steamer from Halifax to Jamaica, belong to the United States.

AUSTRALASIA AND PACIFIC ISLANDS.

Fiji.

Vaughan.

Fiji. Meteorological Observations taken at Suva during 1899. By J. D. W. Vaughan. Suva, 1900. Size 13½ × 8½, pp. 16.

New Zealand—Architecture. *J.R.I. Brit. Architects* 7 (1900): 481–491. **Seager.**
 Architectural Art in New Zealand. By S. Hurst Seager. *With Illustrations.*

New Zealand—Statistics.

Statistics of the Colony of New Zealand for the year 1898. Wellington, 1899.
 Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. xvi. and 540.

New Zealand—Year-Book.

Dadelsen.

The New Zealand Official Year-Book, 1900. Prepared by E. J. von Dadelsen.
 Wellington; London: Eyre & Spottiswoode. 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. vi. and
 648. *Map and Illustrations. Presented by the Author.*

This useful handbook presents a large amount of information on all matters of public interest affecting the colony of New Zealand. A variety of special articles deal with such subjects as agriculture, mineral resources, industries, etc., and a detailed description is given of the separate "land districts."

Pacific Ocean—Soundings.

Somerville.

Report on Sounding Cruise of H.M.S. *Egeria* (Commander Morris H. Smyth) on the Proposed Pacific Cable Route. By Lieutenant Boyle T. Somerville, R.N., N. Pacific Ocean, 1899. London: J. D. Potter, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 12.
Chart. Price 9d. Presented by the Hydrographic Department, Admiralty.

Queensland.

Berry.

The Great Queensland Winter Pleasure Trip. By the Rev. Joseph Berry. (*The Review of Reviews for Australasia*, September, 1900, pp. 355–378.) Melbourne.
 Size $9\frac{1}{2} \times 7\frac{1}{2}$. *Illustrations.*

Account of the voyage from Adelaide to Cairns, in North Queensland, with description of places visited.

Victoria.

Statistical Register of the Colony of Victoria, etc., 1897 and 1898. Melbourne.
 Size $13 \times 8\frac{1}{2}$.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Land Forms.

B. American Bureau G. 1 (1900): 66–74.

Moore.

Introduction to Physiography of Land Forms. By W. C. Moore.

Meteorology.

Bezold.

Bericht über die Thätigkeit des Königlich Preussischen Meteorologischen Instituts im Jahre 1899. Von Wilhelm von Bezold. Berlin, 1900. Size $10 \times 6\frac{1}{2}$, pp. 36.

Meteorology.

C. Rd. 131 (1900): 1298–1300.

Chauveau.

Sur la variation diurne de l'électricité atmosphérique. Note de M. A. B. Chauveau.

Oceanography—Black Sea. *Scottish G. Mag.* 16 (1900): 673–702.

Murray.

On the Deposits of the Black Sea. By Sir John Murray, K.C.B., etc. *With Map and Section.*

Before describing the deposit-samples collected in the Black sea during the Russian Explorations of 1890–91, the author gives a useful sketch of the general physical conditions of that sea.

Oceanography—Drift-ice. *Ymer* 20 (1900): 157–189.

Pettersen.

Our drifisen i Norra Atlanten. Af O. Pettersen. *With Diagrams.*

A summary of results of recent investigations on drift-ice in the North Atlantic.

Origin of Terms.

Nature 63 (1900): 207–208.

[**Gregory.**]

Physiography and Physical Geography. By R. A. G.

On the history and meaning of the terms. In the next number of *Nature*, Dr. Mill calls attention to the use of the term Physiography by Linnæus.

Physical Geography.

Dodge.

A Reader in Physical Geography for beginners. By R. E. Dodge. London and Bombay: Longmans & Co., 1900. Size $8 \times 5\frac{1}{2}$, pp. x. and 238. *Maps and Illustrations. Presented by the Publishers.*

An instructive sketch, for the use of beginners, of the more important principles of Physical Geography, attention being also paid to the human and other life-conditions

dependent on them. It is meant rather to suggest lines of study than to supply details found in ordinary text-books. It is intended, of course, primarily for American readers, and the illustrations are mostly drawn from examples supplied by the United States.

- Tide.** *Nautical Mag.* 69 (1900): 756-773. **Moxly.**
 The New Theory of Tide. By Rev. J. H. S. Moxly.
 Reply to Mr. Plumstead's criticism of the theory (cf. *Journal*, vol. xiv. p. 123).

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

- Historical—Cabot's Landfall.** **O'Brien.**
P. and T.R.S. Canada 5 (1899), (Sec. ii): 427-455.
 Cabot's Landfall and Chart: some criticisms answered. By Most Rev. Archbishop O'Brien. *With Charts.*
 An answer to Dr. Dawson's objections to the writer's theory, put forward in 1897.
- Historical—Cão and Dias.** **Ravenstein.**
 The Voyages of Diogo Cão and Bartholomeu Dias, 1482-88. By E. G. Ravenstein. (From the *Geographical Journal* for December, 1900.) Size 10 × 6½, pp. 32. *Maps and Illustrations.*

GENERAL.

- Colonization.** **Noël.**
 Quel est le régime économique qui favorise le plus la colonisation? Par M. Octave Noël. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. 4^e section—Question i.) Paris: Société de Géographie commerciale. Size 10½ × 7, pp. 14.
 Freedom of trade is held by the author to be one of the most powerful aids towards successful colonization.
- Education.** *B. American Bureau G.* 1 (1900): 271-274. **Brown.**
 Geography work for Primary Children in City Schools. By E. R. Brown.
- Education.** *B. American Bureau G.* 1 (1900): 20-26. **Chamberlain.**
 Geography as a Basis for Correlation. By J. F. Chamberlain.
- Education.** *B. American Bureau G.* 1 (1900): 32-43. **Holzinger.**
 The Points of the Compass, and the Seasons, in Teaching Geography in the Grades. By J. M. Holzinger.
- Education.** *B. American Bureau G.* 1 (1900): 268-270. **Ireland.**
 Geography as seen by the Child. By R. P. Ireland.
- Education.** *B. American Bureau G.* 1 (1900): 27-31, 123-134. **King.**
 Concrete Geography. By C. F. King. *With Illustrations.*
 The writer urges the importance of giving reality to the teaching of geography by vivid description, aided by maps and pictures. He takes the Hudson river as an object-lesson.
- Education.** **Levasseur.**
 Trente-deux ans d'enseignement au Collège de France. Chaire de Géographie, Histoire et Statistique économique. Par E. Levasseur. (Extrait de la *Revue Internationale de l'Enseignement*.) Paris: A. Chevalier-Marescq & C^{ie}, 1900. Size 10 × 6½, pp. 22.
 A summary of the work done in geography and allied subjects during M. Levasseur's tenure of the professorship at the "Collège de France."
- Education.** *B. American Bureau G.* 1 (1900): 11-19. **McCormick.**
 What to Teach in Geography. By Henry McCormick.
- Education.** *B. American Bureau G.* 1 (1900): 5-10. **Miller.**
 Educational Value of Geographical Study. By Elmer I. Miller.
- Education.** *B. American Bureau G.* 1 (1900): 111-122. **Miller.**
 Organic Geography. By Louise Miller.
 On geography viewed as the study of the "unity and organic inter-relationships of the physical earth."

- Education.** *B. American Bureau G. 1* (1900): 209-219. **Rowe.**
 Geography made attractive. By Mary E. Rowe.
- Education—Astronomy.** *B. American Bureau G. 1* (1900): 265-268. **Reclus-Guyou.**
 A School Orrery. By G. P. Reclus-Guyou.
- Education—Bibliography.** *B. American Bureau G. 1* (1900): 157-163. **Chamberlain.**
 A List of Books, Reports, and Articles dealing with the Teaching of Geography.
 By J. F. Chamberlain.
- Education—Map-drawing.** *B. American Bureau G. 1* (1900): 99-103. **Goode.**
 Free-hand Map Work. By J. P. Goode.
 The writer insists on the importance of map-drawing from an educational point of view.
- Education—Methods.** **Dubois.**
 Des meilleures méthodes et des moyens pratiques d'enseignement de la Géographie économique. Par M. Marcel Dubois. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. 4^e Section—Question i) Paris: Société de Géographie commerciale. Size 10½ × 7, pp. 10.
- Education—Methods.** *B. American Bureau G. 1* (1900): 260-264. **Holway.**
 Modeling Mount Shasta. By R. S. Holway. *With Illustrations.*
 On practical work done by a physical geography class.
- Education—Methods.** *B. American Bureau G. 1* (1900): 105-111. **Johnson.**
 Method in Geography. By Willis E. Johnson.
- Education—Methods.** **Overton.**
 A Practical Method of Teaching Geography. By J. H. Overton. (England and Wales); Book 2 (Europe). London: Cassell & Co., 1899. Size 7½ × 11. *Price (each) 6d. Presented by the Publishers.*
 The method consists in causing the pupils to trace in succession (from the outline maps supplied) the various physical and other features of the country studied, naming them at first from the copy, afterwards from memory. The exercises will, no doubt, prove of considerable value, though some doubt may be entertained as to the wisdom of the substitution of tracing for freehand drawing. The author takes up in this respect a position diametrically opposed to that of Mr. Goode in the article noticed above, the latter maintaining that map-drawing by eye is within the reach of all, and a most important aid to the learning of geography.
- Education—Physical Geography.** *National G. Mag. 11* (1900): 470-475. **Dodge.**
 The Teaching of Physical Geography in Elementary Schools. By Richard E. Dodge.
 The writer urges the importance of the teaching of physical geography in elementary schools, not as an end in itself, but as a means to an end.
- Education—Physiography.** *B. American Bureau G. 1* (1900): 43-50. **Collie.**
 Physiography in the Schools. By G. L. Collie.
- Education—Physiography.** *B. American Bureau G. 1* (1900): 60-66. **Kümmel.**
 Laboratory Work in Physiography. By H. B. Kümmel.
- Education—Physiography.** *B. American Bureau G. 1* (1900): 50-60. **Tarr.**
 The Use of Physiography in Geography Study. By Ralph S. Tarr.
- Elephants.** *B.S. d'Études Colon. 7* (1900): 825. **Carton.**
 Note sur l'utilisation rationnelle de l'éléphant. Par J. Carton. *With Illustrations.*
 One of the writer's suggestions is that the tusks of domesticated elephants should be sawn off square and fitted with various implements suited to the special task in hand.
- Ethnology.** **Giglioli.**
 La Etnologia all' Esposizione di Torino nel 1893. Appunti del Prof. Enrico H. Giglioli. (Estratto dall' *Archivio per l'Antropologia e l'Etnologia*, vol. xxix. fasc. 1^o, 1899.) Size 10 × 7, pp. 16. *Presented by the Author.*
- Exploration.** **Claparède.**
 Revue sommaire des principales explorations de l'année 1900. Par Arthur de Claparède. Genève, 1900. Size 7½ × 5, pp. 36. *Presented by the Author.*

German Colonies.

Kolonial-Handels-Adressbuch 1901 (5. Jahrgang) (Beilage zum "Deutschen Kolonialblatt," xii. Jahrgang), Herausgegeben von dem Kolonial-Wirtschaftlichen Komitee. Berlin. Size 10×7 , pp. 184. *Maps.*

Contains a good deal of statistical and other information on the German colonies.

German Hydrographic Office.

Zweiundzwanzigster Jahresbericht über die Thätigkeit der Deutschen Seewarte für das Jahr 1899. Erstattet von der Direktion. Beiheft ii. zu den "Annalen der Hydrographie und Maritimen Meteorologie," 1900. Hamburg, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. iv. and 104.

Imperial Federation. *Fortnightly Rev.* 68 (1900): 1009-1019.

Salmon.

Imperial Federation: the Condition of Progress. By Edward Salmon.

Malaria.

J.S. Arts 49 (1900): 18-26.

Ross.

Malaria and Mosquitoes. By Major R. Ross.

Malarial Infection.

Christophers and Stephens.

The Native as the Prime Agent in the Malarial Infection of Europeans. With Map. (Further Reports to the Malaria Committee of the Royal Society. By S. R. Christophers, M.B., and J. W. W. Stephens, M.D. Pp. 3-19.) London: Harrison & Sons, 1900. Size $8\frac{1}{2} \times 5\frac{1}{2}$.

The influence of the native in the spread of malaria is shown both in the breeding-places of the Anopheles mosquito supplied in the neighbourhood of native dwellings, and in the shelter afforded to the mosquitoes by such dwellings in the absence of breeding-grounds.

Measures of Time, Space, Etc.

Schumacher.

XVII. Jahresb. G. Ges. Bern (1898-99): 95-119.

Die Uebereinstimmung von Zeit, Weg und Kreisteilung. Von A. Schumacher.

The writer advocates a uniform system of division for time, distance, and the circle.

Scurvy.

Wright.

On the Pathology and Therapeutics of Scurvy. By A. E. Wright, M.D. (Reprinted from the *Lancet*, August 25, 1900.) Size $7\frac{1}{2} \times 5$, pp. 8. *Presented by the Author.*

Telegraphs.

J.R. United Service I. 44 (1900): 1381-1407.

Bellairs.

The Routes of Submarine Cables. By Lieut. C. W. Bellairs.

The writer discusses the principles which should determine the choice of cable routes, holding that the single aim should be the assisting of commerce. He condemns the all-British Pacific Scheme as expensive and exposed to more risk than one following a natural route through neutral territory.

Weights and Measures, Etc.

Conversion Tables of Weights and Measures and Foreign Moneys. Prepared by the Philadelphia Commercial Museum. Philadelphia, 1900. Size $8\frac{1}{2} \times 4$, pp. 32. *Presented by the Museum.*

NEW MAPS.

By E. A. REEVES, Map Curator, R.G.S.

EUROPE.**England and Wales.**

Ordnance Survey.

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from February 1 to 28, 1901.

1-inch—General Map:—

ENGLAND AND WALES (revision):—with hills in brown or black, 132, 140, 214, 228 (engraved). *1s. each.*

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35 N.E., 36 S.W., 39 N.E. **Denbighshire**, 3 S.W., 11 N.W., 16 N.W., 23 N.W. **Derbyshire**, 45 S.E. **Glamorganshire**, 7 N.W., 11 S.E., 27 N.E., 36 N.E., 37 S.W., 51 N.E. **Northamptonshire**, 29 S.E., 32 N.E., S.E., 33 S.E., 36 N.E., S.W., 40 N.E., 44 N.W., 50 N.E., 52 N.E., 55 N.E., 59 N.E. **Nottinghamshire**, 33 S.W., 34 N.E., 43 S.W. **Staffordshire**, 18 S.W. **Wiltshire**, 21 S.E., 22 N.W., 25 N.E., 26 S.E., 27 S.W., 28 N.E., 35 N.W., 36 N.W., 41 S.W., 42 N.W. 1s. each.

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(*E. Stanford, London Agent.*)

France.

Thoulet.

Cartes Lithologiques des Côtes de France, par M. Thoulet. Professeur à la Faculté des Sciences de Nancy et à l'Ecole Supérieure de Marine. Paris: A. Challamel. 7 sheets. *Presented by the Author.*

The interesting results of Prof. Thoulet's investigations concerning the submarine lithology of the north coast of France from the Belgian frontier to the Channel islands are clearly shown on these seven charts, which, however, only represent a part of the work which he has completed. The outline and soundings are according to the charts of the "Service Hydrographique de la Marine," and upon these as a basis Prof. Thoulet has shown, by a series of tints and symbols, a vast amount of information concerning the various rocks forming the bed of the sea for a considerable distance beyond the coast-line, extending, in the case of the chart of the strait of Dover, across to the English coast, which is followed from Dover to the entrance to the Thames. On some of the charts there are altogether fourteen different colours and symbols employed, and there is abundant evidence of the very complete and painstaking manner in which the work has been performed. Contour-lines, showing depths of 10, 50, and 100 metres, are shown in bold lines, whilst others are laid down in dotted lines. Prof. Thoulet's work will prove most important to all interested in geology and physical geography.

ASIA.

China.

Koch and Friquegnon.

Carte de la Cochinchine Française. Scale 1:400,000 or 6.3 stat. miles to an inch. Par le Commandant A. Koch. Nouvelle édition, revue et mise à jour d'après les travaux du Service géographique de l'Indo Chine, du Service du Cadastre de la Cochinchine et du Lieutenant Oum. Par le Commandant Friquegnon. Paris: A. Challamel, 1901. 4 sheets.

The first edition of this map was published in 1889, since which date fresh information has been obtained, which is now shown in the new edition. The map is artistically printed in colours, but it is occasionally difficult to distinguish districts which are merely roughly sketched in from those more or less accurately surveyed.

AFRICA.

East Africa.

Hermann, Kohlschütter, and Glauning.

Deutsch-englische Nyassa-Tanganyika-Grenzexpedition. Scale 1:100,000 or

1·6 stat. mile to an inch. Aufnahmen der deutschen Mitglieder Hauptmann Hermann, Dr. Kohlschütter, und Oberleutnant Glauning. Mitteilungen aus den deutschen Schutzgebieten. Band iii., 1900. Berlin: D. Reimer (Ernst Vohsen), 1900. 4 sheets.

This is a large-scale map, in four sheets, of the Anglo-German boundary-line between Lakes Nyasa and Tanganyika and the adjacent country, based upon the surveys made in 1898 by the German Commissioners for the delimitation of the boundary. A general account of the survey work of the British Commissioners, under the superintendence of Captain C. F. Close, R.E., was given in the *Geographical Journal* for June, 1899, accompanied by reduced maps; but this map is on a much larger scale (1: 100,000), and gives additional detailed information, especially on the German side of the boundary-line. It has evidently been carefully produced, and is printed in colours, the hillwork being shown by a system of brown horizontal lines. There is a full explanation of the signs employed, and an inset map is given showing the main triangulation. The map is accompanied by an account of the geodetic work of the commissioners, and the astronomical observations taken to fix positions.

West Africa.

Feist.

Carte de la Côte Occidentale d'Afrique. Scale 1: 1,500,000 or 24 stat. miles to an inch. Dressée par le Lieut. Feist de l'Infanterie de Marine. Service Géographique des Colonies, Paris, 1900.

The recent explorations and surveys of French officers and others in West Africa, together with the rearrangement of districts, have rendered a new map of French West Africa very desirable, and it is, doubtless, to meet this need that this map is being published. The present sheet includes the region from the Senegal on the north to Liberia on the south, and from the coast on the west to long. 10° 40' W. on the east.

AMERICA.

New Brunswick.

Ganong.

Map of the Negoot or South Tobique Lakes. Scale 1: 126,720 or 2 stat. miles to an inch. Compiled by W. F. Ganong from Garden's and McInnes' Surveys and New observations. Natural History Society of New Brunswick, St. John, N.B. *Presented by the Natural History Society of New Brunswick.*

A very rough production, but shows some altitudes and soundings, which are interesting in connection with the drainage system of these lakes.

AUSTRALIA.

South Australia.

Brown.

Geological Map of South Australia. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. By H. Y. L. Brown, F.G.S., Government Geologist. Surveyor-General's Office, Adelaide, 1899. 4 sheets. *Presented by W. H. Duncan, Esq.*

In addition to a full explanation of the colours and symbols employed in this map, a list of the fossils peculiar to each formation is given, and in connection with the lower cretaceous formation there is an interesting table of the artesian wells which have been bored through it, giving their locality, depths, temperature of water, supply of water per diem, depths at which water was struck, etc.

This map does not include the Northern Territory of South Australia.

South Australia.

Brown and Winnecke.

Geological Map of the Northern Territory of South Australia. Scale 1: 1,267,200 or 20 stat. miles to an inch. By H. Y. L. Brown, F.G.S. Physical Geography by C. Winnecke, F.R.G.S. Surveyor-General's Office, Adelaide. *Presented by W. H. Duncan, Esq.*

The data for compiling a geological map of the Northern Territory of South Australia is very meagre, but Mr. Brown has evidently made use of all the information that was available. The topographical features of the map have been compiled by Mr. C. Winnecke from private and official records.

CHARTS.

North Atlantic and Mediterranean.

Meteorological Office, London.

Pilot Chart of the North Atlantic and Mediterranean for January, 1901. Specimen sheet. Meteorological Office, London, 1901. *Price 6d.*

Following the example set by the United States Hydrographic Department, the Meteorological Office have now arranged to publish a monthly pilot chart of the North Atlantic, which, however, is to include the Mediterranean as well. Although on a somewhat smaller scale, and differing considerably in detail, it is in many respects,

The Geographical Journal.

No. 5.

MAY, 1901.

VOL. XVII.

THE GEOGRAPHY OF THE NORTH-WEST FRONTIER OF INDIA.*

By Colonel Sir THOMAS HOLDICH, K.C.I.E., C.B.

NINE hundred miles of frontier boundary, lengthened greatly by many a twist and curve, extend from the north of Peshawur (let us say the Malakand pass) to that point not far north of Karachi where it takes to the sea. This is a distance half as far again as from the Isle of Wight to the north coast of Scotland, and it is as varied in geographical feature and landscape, as full of ethnographical problems, as interesting a study to the geologist or the strategist, not merely as the length of our familiar Great Britain, but as any 900 miles of borderland that can be found in the world. Taken as a whole, it may be considered as the edge of a region of great elevations. Wherever you set foot across the Indian frontier, you place it on the first steps of a staircase which leads through narrow portals by a series of successively higher landings, till (striking northward) you arrive at the roof of the world; or (striking north-westwards) you cross by somewhat lower grades the uplands of Afghanistan and the stony flats and deserts of Baluchistan. Then you reach the mountains and highlands from whence not only the vast majority of the people of India, but most of ourselves also originally emerged as prehistoric nomads. As the great waves of antique humanity which flooded Indiawards set their backs to the north and turned their eyes to the land of promise which lay under southern skies, they all found themselves face to face with the practical difficulty of crossing the mountain borderlands of India, and descending to the plains through the cracks

* Read at the Royal Geographical Society, March 11, 1901. For map, see vol. xvi. p. 596.

and the staircases of the frontier, which we now know so well. It was no case of forty years' wandering in the entanglements of the wilderness, and then the realization of their hopes with them. In many instances they never reached the land of promise at all. Of those that struck against the Himalaya to the east of the Indus, it may fairly be doubted if any succeeded in effecting a passage. There are their remnants—the flotsam and jetsam of many a past nationality—clinging to the skirts of the mountains, or hiding in their inner recesses to this day. But on the north-west geographical difficulties were not so insuperable. The Kabul valley on the north, the uplands of Herat and Kandahar, and the long troughs of the Makran rivers on the south, let in hordes of Skyths, Aryans, and Dravidians, who absorbed the aborigines of the plains, and now constitute the mass of the Indian population. Yet many a remnant has been left on the border, and it is the extraordinary assortment of divers peoples and tongues, and the intricacies of intertribal relationship derived from prehistoric connection, which forms the peculiar ethnographical interest of the borderland. Similarly, its geological evolution by means of those vast slow-moving processes of nature which first upheaved the frontier highlands and then wrinkled and compressed their edges into parallel folds, leaving fissures or cracks at intervals for the rivers to pass from the highlands to the plains, gives us the key to its configuration.

The climate and the scenery of the frontier are not less varied than its peoples. On some of the slopes of the northern mountains, amidst forest of pine and deodar, where the goddess Flora has touched the hill-sides with her wand, and the olive and the pomegranate throw black shadows under an Italian blue sky, the climate is sweet as any climate can be in this incomplete world; but it is not all sweet. There is a region of dusty heat where the sun looks white through a yellow haze, and the shiny surface of the glaring sand-strewn "putt" sheds the scaly skin left by last season's overflow under the blinding heat; where no water is that is not salt, and where no shade is but the occasional shadow of a great rock in all the weary land—a district well enough known to most wanderers on the frontier—which is frequently quoted as the nearest approach to the conventional "jehannum" that this world affords. I know another tract, a little away from the haunts of the frontier official, where not a living thing is to be found. It is said that even flies refuse to live there!

Thus it is small wonder that the popular idea of the Indian frontier is much mixed, and that military service on the frontier is as cordially disliked by some as it is the oft-quoted theme of fond recollections by others. It is with the hope of making plain a few of the broader characteristics of frontier geography, affecting as it does all the conditions of frontier life, that I am here to-night.

Inasmuch as big mountain chains, where they exist, exercise a

preponderating and dominating influence over all other physical characteristics of a country, and as the whole north-west frontier of India is mountainous from end to end, we may very well begin by sketching the main geographical features of it in two sections—i.e. the northern section of hills belonging to the Hindu Kush system, and the southern section over which there looms the straight-backed masses of the Sulimani and their continuation southwards into Persia. For all practical purposes this division corresponds to the political division which has just lately been established between the new province, or agency, of the north, and the Baluchistan agency of the south; with the ethnic division between an aggregation of tribes who are wholly Pathan (i.e. Pushtu speakers), and another aggregation which is chiefly Baluch; also with a very distinct division between certain physical characteristics in climate, biology, and scenery.

That particular parting of the frontier-line which allows the Gomul river to pass from Afghanistan to the south of Waziristan we may take as the dividing-line.

It may at first appear that the far-away central chain of Hindu Kush can have little geographical connection with the immediate frontiers of India; but a little careful tracing out of the plan of the mountains on the map will show you that from the north of the Peshawur plain to the Kuram valley, when we step from the plains on to the foothills, we are treading on the outermost skirts of those extended spurs which, in one continuous and generally unbroken water-divide, reach downward from the Hindu Kush and embrace the Kabul river-basin. That remarkable offshoot, the Shandur range, which, starting from the head of the Yarkhun, or Chitral, or Kunar river (for it is all the same river), shuts off the narrow valley of Chitral from the headwaters of the Gilgit and the Swat and Panjkora—across which lies the dreaded Darkot pass to the north and the Shandur pass between Chitral and Gilgit—continues as a strictly conscientious water-divide, admitting of no breaks, down the eastern side of the Kunar valley. Here it lowers its crest and allows the existence of several passes, which were once somewhat easy links on the high-road from Kabul to India; then rising again slightly where the Kabul river forces its passage by a devious course between conglomerate cliffs (the first break in its continuity since its commencement), it finally culminates in the great level range of Sufed Koh, the dominating feature both of the Kabul and the Kuram valleys. For all its giant independence, entitling it well to rank as a great individual range, the Sufed Koh has thus a distinct geographical connection with the Hindu Kush, and it practically rejoins its old mountain system by means of the low water-divide which heads the Kabul river. Thus the Kabul basin is embraced, as it were, by a long sinuous arm of the Hindu Kush, and the Kabul river forms no exception to the almost universal frontier rule,

that the rivers of the plateau should pass through a gate of the hills hewn right across the axis of them, ere reaching the Indus flats. When Kelly's relief force from Gilgit forced its guns painfully through the snows of the Shandur, it was really crossing the same great divide which is marked by the Lundi Kotal (the Khaibar pass) beyond Peshawur.

South of the Sufed Koh, between that range and the Gomul river, the mountain conformation is comparatively unsystematic and irregular. The long southern spurs of the Sufed Koh (one of which is represented by the Samana ridge which shuts in the Tirah, and another by the Shutargardan) tend to radiate, and their rugged limestone ridges, flanked by a mass of hills of recent formation, extend to the river Indus.

The Kuram valley and the Tochi form no exception to the general rule of main frontier valley formation. They too are tied in at their exit to the plains, and their drainage passes out through mountain gates—gates which so restrict the outflow that past centuries of detritus has accumulated behind them; the grade of the stream has shaped itself to meet the alluvial formation, and we thus get wide spaces of cultivable land, which are terraced and revetted into level fields, and form those landscapes of fertile beauty, with scattered orchards and half-concealed villages, which are so delightful in the early summer season of the frontier. But whilst these main valleys (which also afford the main lines of approach to the plateau from the plains) are usually distinguished by wide spaces of almost phenomenal fertility, the lateral feeders of the main streams which bring down the detritus scooped out from between the narrow intervals between the long lines of tilted strata on either side, afford quite a different class of frontier valley scenery. Here the rough-hewn edges of the broken strata form cliffs which look straight into narrow confined troughs at their feet, with the course of the mountain stream (when there is any stream at all) broken by boulders and waterfalls, amidst a space so narrow that it is frequently impossible to find passable footway. And where the main streams themselves pass through those limestone gates of which I have spoken, there is frequent occurrence of gigantic gorges smoothly cut and fashioned through the hard grey rock, gorges from the depths of which you may look up for thousands of feet to the narrow ribbon of blue sky above. These two varieties of frontier valleys include nearly all the valleys of the great borderland between the plains and the plateau, and the description applies equally to the Baluch and to the Pathan border.

South of the Tochi, Waziristan forms a little geographical Switzerland all to itself on the border. There are no roads through the Waziri hills and over its western watershed into Afghanistan. There are roads afforded by the usual cross drainage into it, and round it, but not across it.

So far we have been dealing with the Pathan (or, as it lately was,

the Punjab) borderland. It is this country mainly which forms the new province, or agency, which has just been formed in India. The point to be noted about it chiefly is that it belongs to a northern mountain area in all its chief physical aspects. The deodars and pines which grace the slopes of Jakko in Simla, which stand out with more of the dignity of isolation in Kafirstan, and are to be seen high on the slopes above Kunar and Chitral, also group themselves gracefully over the grass slopes to the west of Waziristan. The dark round holly-like bushes of the young ilex which are studded over the yellow slopes of the Waziri hills, and the spreading poplar which gives such graceful shade, are trees of the Himalaya. The wild olive grows everywhere, north and south alike, and so do many other trees; but pines are scarce and rare to the south of the Gomul. The deodar is replaced by juniper, and the ilex by the pistachio. It is these trees which form such a characteristic feature in mountain scenery generally, and which certainly give an impression to the traveller in Baluchistan that in crossing the Gomul southwards he has struck a new country. He may, indeed, at first think himself fortunate if he sees any trees at all.

Here, to the south of the Gomul river, commences a new mountain system—a system which, while it exhibits many of the essential features of the northern orography, claims a distinct constructive anatomy of its own. When the great hinterland of the border emerged from prehistoric seas and became dry land, the result as to those edges of it which border the Indian plains is not unlike that which you may observe any day when a rippling tide recedes from a sandy shore. Innumerable ripples, or wrinkles, or folds were formed, not, certainly, by a receding tide, but by the tilting of strata from a line of central upheaval, which, in their general structure (exhibiting the steep edges of the broken strata on one side and the tilted flat backs of them on the other), are very similar in the general appearance of their formation to gigantic sand-ripples. The tilted strata are rocks of comparatively recent formation. The upheaved central line is composed usually of limestone, which is here and there piled up to enormous thicknesses, measuring thousands of feet, and often carrying with it into high altitudes shells and fossils of quite recent types. From these superficial indications you can imagine the general plan of Baluch border mountain construction for yourselves. Line upon line of ridge and furrow, long dominant sharp-backed ridges with jagged saw-like outlines; short thin ridges packed in between as tightly as they can fit; here and there a huge massif of limestone upheaved in grand outlines, upsetting the regularity of minor construction—all running with a parallel trend from north to south, facing India, present about as formidable a barrier to further advance as may well be conceived. Such a phalanx would indeed be impassable, but that its serrated ranks have been cracked across at intervals (as I have already said) to admit of the passage

of the drainage waters from the uplands beyond them to pass to the plains of the Indus. The main streams have held their own way through them, cutting out their own gateways and gorges through conglomerate and limestone, through all geologic changes, and it is these gateways and gorges which are our approaches to the uplands.

The narrow little troughs between the ridges have, of course, been scooped out by successive floods till there is little enough left but bare rock, but there are now and then small bays and offsets to the main streams on either side, where land can be terraced and irrigated, and villages can find a footing.

The regularity of these parallels and approaches which guard our frontier between the Gomul and the Arabian sea, and then continue through Makran and Persia to the head of the Persian gulf, is much disturbed between Sukkur, on the Indus, and Quetta, on the highlands. There a great wedge of sandy desert and Indus alluvium (called putt) breaks into the line, the effect, or result, of some hidden force of nature which has diverted the mountains, curved them from their course, and piled their thousand ridges into a tangled knot round Quetta. Here, as might be expected, are some of the highest peaks of the frontier, running to 11,000 feet and more, overlooking the plain on which the pretty station of Quetta stands. The sand and putt-covered wedge of Gandava is the opportunity for our railway, which is thus carried much farther west on the flat plains before mounting the hills than would be possible elsewhere. Beyond Quetta, between Quetta and Kandahar, the great border ridges and ranges still keep their rigid way from north-east to south-west, preparing for the great sweep westwards of half their company. The Kojak is one of them. The other half company preserves its southerly trend past Kalat to the Karachi frontier, and forms a phalanx of stiff-backed, sheer-sided, wall-like obstacles to any advance from Sind that is, I believe, unsurpassed by any frontier in the world.

As to the character of this southern border scenery, where the great central masses of limestone are piled in the grandeur of an eternal disarray of cliff and chasm, of towering peak and deep torrent-washed gorge, to a height of over 10,000 feet (as, for instance, in the mountain known as the Takht-i-Suliman, which gives its name to the system generally), there is no lack of magnificence in outline, or of the grace of picturesque vegetation. The Chilghosa pine stretches out its weird white arms all over the heights of the Takht, and over many another mountain peak besides, and it is no less striking here than it is on those other heights overlooking the Indus—the heights and slopes of Astor, in Kashmir. And from the summit of these great hills, who shall describe the grandeur of the view? To me there will always be an impression, first, of stupendous depth, then of line upon line of jagged mountain-top growing out of this depth, a silent shimmering

sea of misty grey hills sharpened into points and pinnacles, a faint white stretch of plains beyond, and a far-off blue-black streak marking the riverain of the Indus. But below the summits of these mountains, amongst the ridges or on the uplands, where one is not overpowered by the vastness of the enclosing walls of some deep gorge, or fascinated by the occasional revelation of gentle olive-covered slopes sweeping down to a central band of green vegetation; when one is not wandering amongst the junipers of Ziarat, or stretched amongst the early summer tulips and narcissus of the Kojak; but when one is making a slow and painful progress in these waste places which form the vastly greater portion of Baluch country-side—what about the scenery then? Arid and dry, with the white hot haze shimmering about the rocky crags of the scaly hills; a small salt trickle meandering through the stony nullah bed, and leaving a sticky leprous edge along its yellow banks; the stunted tamarisk powdered with salt and dust, all grey, khaki, dun-coloured, and glaring—the Baluch landscape is not so alluring. And there is so much of this, and so little of the other, as to lend a certain reasonableness to the Baluch tradition that at the creation of the world the rubbish was piled into Baluchistan. And yet we must remember that throughout that wild southern borderland, into the inner recesses of which but few Europeans have ever really penetrated, where there must exist thousands of peoples—Baluch (or Arab) peoples, Aryans, Dravidians, and Pathans—who have never seen a white face and never heard an English word spoken, there are still infinite possibilities of development. What has been done in Peshin or Zhob, might be done in a hundred other valleys, not so extensively perhaps, but yet with ample justification for the hope of fair returns. Indeed, there are dozens of spots which might be pointed out where the evidences of an old and better order of agricultural development are abundantly evident, especially in Southern Baluchistan and Makran. Baluchistan is, indeed, an old country once developed and civilized, now withered and dried, and the problem to be usually dealt with is that of bringing water back where water once existed and exists no more.

A few words about the infinitely varied ethnical features of the frontier may not be out of place, and I will endeavour to draw the line of distinction between the main features of this complicated agglomeration of varied nationalities as broadly as possible. The most simple division of the frontier tribes-people will be that which places them in two great communities, *i.e.* the Pathan or Pushtu speaking fraternity and the Baluch. In this great ethnic division the arbitrary line of geographical division which I have selected as being represented by the Gomul river is not entirely satisfactory, for there are, as I have already pointed out, large and important Pathan tribes existing not only in the Sulimani mountains to the south of the Gomul,

but extending southwards to the Quetta district. Indeed, the parallel of latitude on which Quetta stands more aptly defines this ethnical division than does the Gomul river. There are no true Baluch tribes in the Zhob valley, although this valley is an integral part of the politically defined Baluchistan province, or agency, and thus it happens that the occupation of the Zhob valley which shuts off the Sulimani mountains from Afghanistan is a strategic movement directed against Pathan rather than against Baluch tribes-people. There is a third section of border peoples in the far north, the Chitralis, who claim no sort of affinity, excepting that of religion, with their Pathan neighbours. They are a very ancient race, belonging rather to Himalayan than to Indus frontier ethnography, and we must for the present pass them by. South of Chitral the Pathan races, who occupy all the northern sections of the long straggling new province of the frontier are chiefly represented by large tribal communities of Afghan origin. The Yusufzais of Swat and Boner, and the Mohmands, who spread southwards over the barren hills which overlook the Kabul river, are all of Afghan origin, claiming ties of race affinity with the Durani Afghans of Afghanistan. So that here again the political boundaries are by no means coincident with ethnical divisions. We find large and important tribes of undoubted Afghan extraction who are beyond the border of political Afghanistan, and it was the separation between them and the parent stock, effected by recent boundary demarcation, which was one of the chief causes of the serious risings on the north-west frontier which culminated in the Tirah campaign. But whilst all Afghans are Pathan in so far as they have adopted the Pushtu tongue, all Pathans are not Afghan, and south of the Khaibar we find in the Afridis, Orakzais, Waziris, Sheranis, Kakurs, etc., races whose origin is not always easy to define—large and powerful communities, always ripe for mischief, who have never within recent historical times been efficiently under control, either from the side of India or Afghanistan. They claim no relationship with the Afghan. They are some of them older races than the Afghan—a people who have held their mountain fastnesses against all outside aggression for more centuries than we can tell; and yet they are in no sense aboriginal, for they belong to one or other of the innumerable Aryan or Skythic overflows from the highlands of Central Asia which have peopled India, partly displacing, partly absorbing, the non-Aryan races which existed before them. But non-Afghan though they may be, they are co-religionists with the people of the Amir, and it is westward and northward toward the ancient land of their early beginnings that they will inevitably turn their eyes for refuge and assistance in times of difficulty and danger. When we talk of the Mohammedan religion in connection with India, and speak of the British Empire as a Mohammedan as well as a Christian empire, we must remember that the strength and vitality of

Islam in India, its fanaticism and its orthodoxy, are really maintained by these frontier peoples, and perhaps by one or two of the native states of the peninsula; not by the great mass of Mohammedan peoples of the plains, who form by far the larger proportion of the fifty million of Mohammedan subjects of the king. The Mulla is of little account in Lower Bengal. It is only amongst the Pathan peoples of the north-west frontier that he is a moving political force. His voice, indeed, is not much heard south of Quetta, where, whilst we are still dealing with orthodox Mohammedan tribes, we meet with peoples as distinct from the Pathan of the north in social organization as they are in ethnical affinities.

The inhabitants of Baluchistan are as varied in their nationalities, and as ubiquitous in origin, as are the inhabitants of Afghanistan. They range from the pure Persian to the pure Dravidian. Turks and Rajputs, Kurds and Monguls, are all to be found amongst them. But the dominant tribes are represented by a great community of people of Semitic origin, and when we speak of Baluch we usually mean one of the great Rind federation. The true Baluch is not of very ancient extraction. He can usually be traced to Arabia or Syria, and he probably owes his existence on our frontiers chiefly to the Mohammedan conquest of Sind in the eighth century of our era, which established Arab domination on the Indus for nearly three centuries. There were Arabs in the West of India long before then—they were there long before Alexander's time, and they have left the mark of their colonies in Southern Baluchistan as imperishably as any that may be found in Rhodesia. But the modern Baluch usually traces back his pedigree with great confidence to the tribe of the prophet, and cares to go no farther. In appearance, in manners, and in disposition, many of the finest of the Baluch representatives are almost typical Arabs of the town-bred class, such as one may meet in any of the coast towns of Arabia, and always be glad to meet again. As a professional robber and raider the Baluch is in no way inferior to the Pathan, but his methods differ, and his standard of ethics is undoubtedly higher. The quality of chivalry is not forgotten by these descendants of a people who claimed affinity with the Saracen, and loyalty to the chief of their clan is traditional; loyalty to his chief with the Baluch takes the place of the Pathan's blind confidence in his mulla. It is sometimes asserted that the Baluch tribesman is a much easier man to deal with politically than the Pathan. This is certainly true to some extent, for he is far more faithful to his engagements when made, and far more open minded in the making of them. But it is due to no lack of the quality of courage or independence. The success of the Baluchistan administration, which for so many years has differed in many important respects from that of the Punjab, must be attributed largely to the wisdom of its conception in the first instance. Baluchistan, indeed, of

late years has been in the position of that happy land which has no history. Not a single important tribal rising has occurred since the first occupation of Quetta.

The political geography of the frontier is a matter of too great interest just at present to be passed over, and we must devote a short space to it.

It appears to me to be very little understood that for fifty years the red ribbon of British occupation has not materially shifted its position on the north-west frontier of India. We took the Punjab from the Sikh, and Sind from the Amirs who ruled it, about sixty years ago, and where we found their frontier-line drawn, there it is, for the most part, drawn now. It is all very well to call it an unscientific frontier, but the hard-headed Sikh of the north did not do badly when he set that line at the foot of the stony frontier ridges, saying, "I will take all the flats and the plains, the cultivation and the jungles of the Indus riverain, and you may have whatever you can make of the sun-baked hills and valleys beyond." Nearly all along the frontier there is a very respectable width of stony glacis, separating the hills from the alluvial tracts, uncultivable and yet open. There was, probably, no very strict demarcation in pre-British days. Those slopes of stony "dasht" were the practical hedge between Sikh and Pathan. Of course, from the military point of view, a frontier which admits of a long craggy arm reaching out from the mountains into the plains separating the valley of Peshawur from the valley of Kohat—an arm wherein an enterprising foe can collect his people and do infinite mischief by sudden descent on either side—is most unscientific; but there it was in the time of the Sikh, and there it is, with a minor arm to the south of it, still. No change has taken place. We have not occupied it, and but very few indeed of the frontier officials have ever seen the interior of it. As for the Baluch frontier, south of the Gomul, there is nothing much to be said about it. For mile upon mile a solid uncracked wall of rock, several thousand feet high, faces the sands of Sind, and makes as perfect a barrier as art or nature could desire. Directly across that barrier, behind which lurk the Dravidian peoples of the south, no European ever passes. Only by the two great recognized passes of the Baluch frontier, the Mulla and the Bolan (with which I include the Harnai railway route, as both centre on Sibi, at the head of that Gandava sand-wedge of which I have spoken), can one reach the Brahui hills.

Such, then, is the true boundary of British India, and beyond it (with the exception of that restricted area which we call British Baluchistan) lie the independent Baluch and Pathan peoples of the borderland, governing themselves after their own feudal system, subject to tribal laws, and only subservient to British authority in that they are bound to preserve peace on the border, and keep their own frontier

intact. Beyond them, again, lies Afghanistan, and the recent demarcation of the boundary between these independent tribes and Afghanistan, which led to a not unnatural fear of absorption into British territory, was the dominant cause of the late general rising of the tribes on the north-west frontier. But their removal from the sphere of interference on the part of the Amir did not mean annexation to British India, and to maintain that the red line should be drawn on our maps so as to include Chitral, Kuram, Tochi, and Baluchistan is only to repeat the error which was made by the ignorant tribes-people themselves. But the security of our frontier from aggression in certain parts of the border, and the necessity for enforcing our principles of peace on the frontier everywhere, have necessitated the occupation of certain lines of approach, and certain advanced posts dominating Chitral, the Khaibar, the Kuram, Tochi, Gomal, and Bolan (all of which are highways of more or less significance into India from the plateau), which serve these two purposes, giving us the power of direct control over these wild mountaineers in a degree which is more or less effective in different parts of the frontier. Only in Baluchistan have we acquired the right, partly by conquest recognized in the treaty of Gandamak, partly by the ordinary business procedure of paying a quit-rent for possession, to enclose certain districts (Peshin, Tal Chotiali, Sibi, etc.) which centre about Quetta, and to call them British. Here British authority is as fully established as in any part of British India, the forms and methods of administration being of the regulation pattern.

As regards the degree of independence enjoyed by the various "independent tribes of the frontier," it can only be said that it varies greatly with the geographical conditions of their habitat, and the strategic value of our lines of occupation. In some parts of the frontier (notably in Baluchistan) the European traveller may move in fairly comfortable security, and often be hardly able to recognize the fact that he is not on British Indian soil. In others (notably amongst the wilder Pathan tribes) it would be exceedingly risky for him to cross the border without a strong and well-armed escort. In yet others it would take a whole division of troops, and all the accessories of a small campaign, to enable a frontier officer to inspect the line of boundary pillars which he has himself but recently set up. Within the recognized limits of British India there are a large number of native states governed by their own hereditary chiefs, independent of British control except in such matters as might affect the security and peace of the Empire, around which we are accustomed to draw a yellow line in our maps to signify that they are not yet our property. It appears to me that the independent tribal provinces of the frontier should be treated in exactly the same way. Much of the confusion which exists in the mind of the public between the *meum* and *tuum* of borderland political geography is caused by a want of clear definition in our maps. If, on the other hand, all is to be coloured

red which betokens the sphere of British influence (a term which may mean anything or nothing), then we may as well make our red line coterminous with Persia, with Russia, and with China at once.

Two provinces or agencies now represent Indian border administration on the north-west. The northern of the two has just been formed as an administrative unit independent of the Punjab Government. It includes a long straggling strip of independent mountain borderland stretching from the Gomul river to the Afghan border beyond Chitral, as well as that section of British India which lies between the Indus and the frontier. To the east of it is the Punjab and Kashmir; to the west there is Afghanistan. It will be observed on the hand map that the red line of British possession has been drawn round Kashmir. This is not strictly accurate, for Kashmir is a native state as independent as some of those in the Indian peninsula; but it was more important to define the independence of those tracts which lie between Kashmir and Afghanistan than to emphasize the independence of Kashmir itself. It must be remembered that Kashmir was once British property, acquired by right of conquest from the Sikhs, and it is at the present time so much in British occupation that it has come to be regarded as the traditional playground of the Englishman in India, and almost as a part of the empire. Kashmir, however, forms no part of the new administrative charge, which is concerned almost entirely with the Pathan border tribes existing both within our frontier and beyond it. The watchful political eye of its commissioner will be on Chitralis, Swatis, Mohmands, Orakzais and Afridis, Turis, Dawaris and Waziris beyond the red line, as well as on the Khuttaks and Bangashes of the Kohat district within the red line, but beyond the Indus. These are mostly Pathan peoples, and they represent an agglomeration of nearly all the most troublesome tribes of the Indian borderland, scattered through a most difficult country extending for a distance greater than that intervening between London and Edinburgh. It is indeed a thorny charge, and the result of a scheme which separates it from the well-tried and carefully constructed machinery of Punjab administration will be watched with an interest which will not be altogether free from anxiety.

The Baluchistan agency, which equally includes an area of territory pertaining to British India as well as a vast wide space of mountains and desert occupied by absolutely independent tribes, has long ago justified the administrative system which was first introduced by Sandeman. The success of his form of political supervision over the diverse interests of the infinitely varied nationalities represented in the Baluchistan agency has doubtless prompted the counsels of the Supreme Government in effecting another border agency on similar principles in the north, and thus relieving the Punjab Government of a most responsible burden. But neither the ethnographical conditions of the southern

border, nor the strategical position which we occupy in relation to the tribes themselves, are the same in the northern borderland as in Baluchistan. And the idiosyncracies of the people differ. The Baluch chief is the real (and not merely the titular) head of his clan, and he is not in the hands of the mulla and the fanatic. And in that part of Baluchistan which is peopled with Pathan democrats, again we occupy a better military position than we possess in the north—a position which entirely dominates them, and, in fact, leaves them no option but to behave themselves.

No geographical sketch of the frontier, however imperfect, can pass without a reference to those conditions which determine our strategical position thereon; and these conditions are not so complicated as they would often appear to be. The northern flank of the frontier is protected by a vast wilderness of mountains, so unbroken in its massive continuity that the interminably long narrow valleys which wind about its recesses afford the only practicable foothold for man or beast. Between the Indus and the Kunar (or Chitral) river, across the southern outlying spurs of the Hindu Kush, strategical lines of approach to India are so little worth consideration that we will waste no time in discussing them; and although certain passes practicable for small parties of travellers do certainly drop into the Chitral valley from the north, leading downwards from the Pamirs and Badakshan, I will (having seen something of them) set them also on one side, merely remarking that all these problematical routes to India pass within reach of the dominating fortress of Jalalabad. A serious menace to India from the north can only be directed along one or two lines. One is the historical valley of the Kabul river, the open road down which Aryans and Skyths, Greeks, Afghans, Monguls, and Turks have swarmed into the plains, changing the destinies of India and altering the roll of its nationalities. Beyond Kabul are the snow-bound barriers of the Hindu Kush, but they are traversed by roads fashioned on European models, which bring the traffic of the Oxus to the streets of the city. It is Kabul itself which blocks the way, and the Amir is the true warden of this northern frontier.

Another line is on the south, where there is the more open approach over the "dashts" and deserts of the Persian border—by Herat, Sistan, or Kandahar and Quetta. From the Caspian to Quetta a traveller may pass without encountering a single formidable pass, without rising to higher altitudes than are indicated by Quetta itself, some 6000 feet above sea-level.

On the extreme west, again, is the ancient high-road from Syria and Persia, which lies through Makran. By this way India received her contingent of Dravidian and Semitic, or Arab, peoples. For centuries the whole Indus valley lay under the sway of the Arab who passed by this route. But Makran is within reach of the sea, and whilst we have

command of the sea, we may regard the Makran gateways as looked. ~~However, the~~ northern and southern routes of Kabul and Kandahar, ~~across the~~ borderland of independent tribes, there are, indeed, passes ~~innumerable~~ intersecting the mountains. But these also may be held ~~as practically~~ unimportant so long as the two great avenues of Kabul and Kandahar are in our hands, for they are narrow, rugged, easily ~~defensible~~, and within striking distance of one or other of these two great strategic centres.

Our borderland posts and lines of occupation to the north and south respectively, are, from their geographical position, rendered distinct in purpose. Those on the north are well enough adapted for purposes of political control and observation both of Afghanistan and of the independent border, but they have not much strategic significance in themselves. We should not sit still and wait at the Malakand or the Khaibar, at the Peiwar or Wana, were a serious invasion from the north threatening us. They are not defensive positions, nor do they even completely dominate the independent tribespeople they are supposed to overlook, for they are not sufficiently in command of their western communications with Afghanistan; but with their assistance we can readily secure the means of occupying stronger and better strategic positions beyond them—they give us a right of way—and so far they are invaluable adjuncts to our strategic frontier.

On the south the geographical conditions are different. Not only does the position of Quetta, with its remarkable command over divergent ways to north and south, to east and west, render it a strategic position of importance such as can be claimed by no other position south of Jalalabad and Kabul, but an easy line of occupation and a connected chain of posts along the line of the Zhob secures to us the back premises of the Pathan border tribes of the Suliman hills, and thus gives us an assured guarantee for their good behaviour, which is sadly wanting further north. The unruly mountaineer hesitates to sharpen his sword and sling his jezail for a foray across the border eastward, when he knows well that, with the coming of the inevitable reprisal, he will find no convenient exit by his back door westward into the universal harbour of refuge for evil-doing Mohammedans—Afghanistan. So that, locally, we are strong in the south. And in the wider sense of Indian defence we are even stronger. For Quetta must be regarded as the bulwark, not merely of Sind, which lies behind it (there are no high-roads into the heart of India yet across the wastes of Sind and the deserts of Rajputana), but of the same northern valleys and plains of the Punjab, which have ever been the objective of an advance from Kabul. The Arabs who passed through Makran to the conquest of Sind never reached Delhi through Sind. But they reached the Peshawur valley and Kashmir, and there they remained. So that it is ever northward that we must turn our eyes, remembering that the geography of to-day

(though it may be modified by railways) does not vary with the introduction of new military weapons and methods, and that to secure India from aggression in the future we should study the pages of the past, and keep our special reserve of strength for the Kabul valley and the gates of the Punjab. What we have learned anew (as much from the experiences of Tirah as from those of South Africa) is the deadly facility of defence which mobility in a rugged country ensures. It is a good and a useful lesson which may comfort the hearts of those who think that it would be an easy matter to repeat history and to overrun India once more from the highlands of Asia.

After the reading of the paper, the following discussion took place:—

General Sir JOHN J. H. GORDON: We have listened to-night to a most interesting lecture, which I am sure, with the views displayed on the screen, has given every one here a graphic picture of the wild borderland provided by nature as India's defence on the north and west. No one is better qualified than Sir Thomas Holdich to adequately present to us those literary and pictorial sketches of nature in her boldest moods. What he has described to-night has brought back to me vivid memories of an interesting part of the north-west frontier of India, which he and I visited together some years ago, when he did so much to fill up a great blank in our geographical knowledge of that important region. A point to be noticed with regard to this vast and formidable breadth of mountainous country lying just beyond the threshold of India, is that its inhabitants are all splendid fighting men, who glory in the fact that kingdoms and armies have come and gone, but that they remain independent. All the best fighting elements of Central Asia seem to have been gathered into this stronghold. The wild scenery has produced turbulent men. Time may bring home some civilization to them, and at this moment, under the hand of an able and strong Amir of Afghanistan, some advance is being made in this direction. There is an immense amount of interest in the subject of this lecture, human and otherwise, which I do not feel capable at present of commenting fully upon, and if the little I have said has been more from the soldier's point of view than from the philosopher's, I trust that my predilections will be accepted as my apology.

Sir RICHARD TEMPLE: I obey your behest to say a few words on this most interesting subject. Time was when I used to lecture on this very subject, from this table, to an audience very much like what I see before me to-night. It is a great pleasure to me to find myself in old haunts and familiar places. You have heard a picturesque, well-informed, and graphic address. But what is the lesson that you and I ought to learn? It is this, that we have a real scientific frontier. There was a great statesman, for whom I have the utmost respect, who said that the frontier was unscientific. But for once he was wrong. Sir Thomas Holdich has shown us that the frontier is scientific as regards the geology, the plateaux, the plains, the natural barriers, the strategic points. Surely that is a scientific frontier, designed by nature herself, the great teacher of science. Nature understands these matters, or rather the Creator who made nature, far beyond any feeble ideas of ours. Of what does the frontier consist? One vast serrated wall with gates and doors here and there; and I will say to my countrymen, having a long acquaintance with the subject, that as long as you have command over these gates and doors, do not waste your resources, spend your money, and shed your blood in going beyond this wall.

My concluding words are these. All our frontier arrangements depend on our being friendly with Afghanistan. This is not an Indian, but a European question. As long as you have the friendship of Afghanistan and retain command over the almost impenetrable wall raised by nature as above described, you may depend on having skilled British officers with faithful and gallant Sepoys to defend the land which lies behind—that is, on the British side of the border.

Sir JAMES HILLS JOHNES: I will not detain you long. I wish simply to tell you that I have come a long way to hear your excellent lecture, and I have been well repaid for having come. I do not know that I am in a position to carry much weight, because I retired years ago, but I must record my approval of your able paper. I have had the frontier question much in my thoughts, and what you have said to-night emphasizes my views. The great point that we must see to, is that we keep the friendship of the Ameer of Cabul. He has made Afghanistan a strong power, and it will be for our mutual benefit to be warm allies.

Dr. BLANFORD: There is no part of the interesting address from Sir Thomas Holdich more deserving of the attention of geographers than the intimate connection which he has shown to exist between the physical geography of the north-western frontier of India and its political, military, and commercial history. That physical geography is both remarkable and interesting, and is closely connected with the geological history of the Indian peninsula. In that wonderful work by Suess, '*Das Antlitz der Erde*,' a book already in great part translated, and well translated, into French, but hitherto, I regret to say, not reproduced in English, there is a masterly summary of the subject, to which I should like to call the attention of all interested in physical geography. Very briefly the views expressed are the following:—

In the Mesozoic era of geology, at the time when the British oolites and chalk were being deposited, the land that now forms the peninsula of India was part of a continent, of which other surviving fragments are to be found in Madagascar and Southern Africa. A very large area in Central Asia, including part of the Tibetan plateau, now 15,000 to 20,000 feet above the sea-level, formed a great eastward extension of the Mediterranean. In early Tertiary times the sea still occupied a great part of South-Western Asia, including the Indian north-western frontier. Then changes set in, and from all directions pressure, caused by crust contraction or other agencies, was exerted against the resisting solid mass of India, and resulted in great crumpling of the rocks. The greatest pressure came from the northwards, and to this we owe the mass of the Himalayas, but other thrusts were exerted from the east and from the west, and resulted in the formation to the eastward of the ranges of Assam, Arrakan, and Burma, and to the westward of the mountains of our scientific frontier. So far as I have had an opportunity of investigating the physical features of the country, they agree with Suess's theories.

The results of the crumpling and folding of the rocks in late Tertiary and probably even in almost recent times, coupled with the denudation, especially of the softer beds, are to be seen in the parallel ridges of Afghanistan and Baluchistan. None of the mountains on the Indian frontier are of great geological antiquity. It is in connection with the late formation of the ranges that the river gorges which traverse them are especially interesting. Even the Himalayas are cut through by the Indus, Sutlej, and Brahmaputra, and also by some of the smaller rivers which form tributaries to the Ganges. In the same way, on a smaller scale, as Sir Thomas Holdich has pointed out, the Afghanistan and Baluchistan ranges are frequently cut through by streams of no great size or importance. Two remarkable cases are worth mentioning—one is the well-known Chappar rift, through which the railway runs

between Harnai and Quetta. Here all the drainage of the valleys around Kach and Kawás traverses the narrow gorge in the anticlinal range forming the northern side of the Harnai valley. The other is very little known, and is even more remarkable. The southern part of the Suliman range, south-west of Dera Ghazi Khan, terminates about 60 or 70 miles from that station in the neighbourhood of the Cháchar pass. A few miles to the north of this pass, where the range is at least 3000 feet high, it is cut through from west to east by a stream, the Kaha, which drains several hundreds of square miles to the westward of the range, and then, instead of making its way southward over fairly open country composed of soft rocks, it cuts through the hard sandstones of the Suliman range in a magnificent gorge, or what it is the fashion in these days to call a cañon, and debouches on the Indus plain about 50 miles south-west of Dera Ghazi Khan. There is no reason to attribute these gorges to fracture; in all the cases I have seen no evidence of dislocation or cracking can be traced. These wonderful chasms result from the slow but persistent action of the sand and gravel carried down by the streams; they are a magnificent effect of what have been termed "antecedent" rivers, and whether in the ravines of the Suliman or in the great valleys of the Himalayas, they bear witness to the same fact,—that the rivers which cut them are older than the mountains in which they are eroded.

Captain YOUNGHUSBAND: I should much have liked to engage in a political discussion on this question, but I think perhaps I had better confine myself to the scientific aspect of the lecture which has just been read. The point I should like to emphasize most is the great extremes which are to be noticed there, both in the climate and natural features of this country, and which are reflected in the character of the people themselves. The great extremes of climate, heat in summer and cold in winter, the rapid changes between day and night, winter and summer, are characteristic of the people, who are for ever in extremes. At one time you find them gay and jubilant, engaging in a game of polo, and talking to you in the most friendly way, and the next moment rising up against you without the slightest possible warning and without any apparent cause. This is characteristic not only of the Chitralis, but of most of the people of the frontier. It is due, I think, to the nature of the country and the climate.

I have been noticing lately the people of the Mohammedan state of Tonk, in Rajputana, who originally came from the frontier; they left Boner about 150 years ago, and formed part of the Rohilla bands who defeated the Mahratta and other chiefs of that period. But now, instead of being of a warlike, impressionable, and fiery character, I found them toned down into a mild and quiet people, and seemed to have lost all their manliness. I hope that in our future dealings with the frontier tribes we shall try to preserve this characteristic, but also take precautions that it may not be used against ourselves.

On the motion of Sir John Gordon, a cordial vote of thanks was passed to Sir Thomas Holdich for his paper.

TOPOGRAPHY OF SOUTH VICTORIA LAND (ANTARCTIC).*

By LOUIS BERNACCHI.

THE conception of a great *terra Australis incognita* has been proved to be equally erroneous with the conjecture that no land whatever, or of only trifling extent, was to be found. It has been proved that extensive masses of land exist within the antarctic circle; but whether the land takes the form of a vast continent, or an archipelago of islands smothered under an overload of frozen snow which conceals their insularity, or islands whose shores are washed by the ocean, remains still an enigma, and a fascinating one to be solved by future expeditions. It is, I think, premature to call it "the Antarctic Continent," for explorations on the American side, and even on that of Australia, tend to prove the existence of a broken-up continuation of these two continents with the most extensive masses of land lying under their respective meridians.

The coasts of Wilkes Land and the Balleny islands appear to be a duplicate of the Australian coast, so the gigantic mountain range to which the coast of South Victoria Land rises seems to correspond to the mountain chain of New Zealand; while the volcanic extremity of the cordilleras of South America finds its counterpart in the broken and scattered island masses also bearing volcanoes to the south of Cape Horn. The prolongation of the volcanic ring, or "circle of fire," from New Zealand to Balleny islands, South Victoria Land, and right across to the American side, seems to support this theory. Prof. Arctowski, of the *Belgica* Expedition, has suggested that "Graham Land is connected with Patagonia by a submarine ridge, which forms a great arc extending between Cape Horn and the South Shetland islands, and that the tertiary chain of the Andes reappears in Graham Land."

Although, perhaps, the explorations of the *Southern Cross* have not thrown much light on this matter, the great mass of geological specimens collected might, if properly dealt with, assist very materially in arriving at a better knowledge of the conditions of things. The ship *Southern Cross* of the Newnes Expedition entered the antarctic ice-pack on the last day of the year 1898, and was nearly fifty days before penetrating to the ocean beyond, during which time she thrice crossed and recrossed the antarctic circle. This, with the exception of the *Belgica*, is the longest period a ship has ever been involved in that pack. Our long imprisonment was due to having entered it so far west, in long. 158° 53' E., where it is very dense and heavy.

On first entering, ice was visible to the horizon in the south and west, whilst in the east and south-east there was open water. Our

* Read at the Royal Geographical Society, March 18, 1901.

experiences, and those of other expeditions, tend to prove that the ice-pack on the Australian side of the antarctic circle is not nearly so dense in an easterly as it is in a westerly direction. Ships that have entered the pack in about 170° E. long. have penetrated it in a few days, whilst those entering it between 150° and 165° E. have taken more than a month. There are numerous instances in the history of antarctic navigation which go to prove this. A strong cold surface current appears to set out from Ross sea in a north-westerly direction, driving the ice up northwards, between Kerguelen island and Australia. At Cape Adare huge bergs were often observed, during perfectly calm weather, travelling at about 4 knots an hour towards the north-west. The prevailing south-east winds are also a factor in driving the ice in that direction.

The sea-ice, which constitutes the bulk of the pack, is first formed by the freezing of the sea in the winter along the shores of the antarctic lands. This freezes to an average depth of from 4 to 5 feet, and extends out into the ocean for perhaps 50 miles, until the formation of an uninterrupted sheet of ice is prevented by its perpetual violent agitation. This ice begins to break up early in November, and move northwards, and by the middle of January the coasts are almost free. As this body of sea-ice moves towards the north, it is frequently driven back by northerly winds. Thus, in consequence of the circumstance that land lies to the south, which excludes the possibility of more sea-ice following in support, an open sea, comparatively free from ice, is met with in the antarctic regions almost regularly when the principal zone of pack-ice has been pierced. Serious danger from ice-pressure in the open pack is comparatively slight. Once, on January 24, a rather severe pressure set in during a gale from the E.S.E., when the *Southern Cross* was fast wedged in the ice. On the port side the blocks piled up to a height of nearly 15 feet, and on that side the ship was lifted 4 feet out of the water, but at no time were we anxious for her safety. The pack, very susceptible to a gale, drives before it, and so there is really no danger, for there is no resisting force. But woe betide a ship that ventures to winter near the coast, unless it be a well-sheltered inlet, for when a pressure sets in there, it piles the huge blocks of ice up on the shore to from 20 to 60 feet, and a ship would surely be crushed, no matter how strongly she may be built. A real source of danger, however, is a gale or a very heavy swell on the edge of the pack, when huge masses of ice crash into the sides of the ship with terrific force, causing the tall masts to quiver for some seconds after the shocks, or the mighty blocks grind in against the sides as they pass.

At noon on January 12, a faint grey light was sighted on the port bow. At one time it looked like a cloud, at another it had the appearance of land. Finally it proved to be land, and very high land too. Our latitude at the time was $65^{\circ} 3' \text{ S.}$, and longitude $161^{\circ} 43' \text{ E.}$,

the land bearing S. 20° E. true, distant about 70 miles. The day was beautifully clear, and not a breath of air stirred a ripple on the glassy patches of water. The land was at first taken by the captain to be some undiscovered island. I went up into the crow's-nest to have a better look-out; the captain was there in a great state of excitement, so convinced was he that he had discovered new land. Most of us, however, were extremely sceptical and could not participate in his elation. It seemed improbable that such an able navigator as Sir James Ross, who actually went over the same ground, should have missed this discovery. When we perceived a dull volume of smoke rising from the east end of the land, undoubtedly the smoke of a volcano in activity, we decided it was one of the Balleny islands upon which Balleny mentions the presence of an active volcano. As we approached closer, the outline of the land became admirably clear and defined.

Owing to the abundance of light reflected from the white, glittering snow-clad surface, few shadows were cast on any part. Observed through the telescope, abundant detail could be made out. A vast mantle of snow descended to within 600 or 800 feet of the sea, and there ended abruptly. This snow-line was easily traced right along the land even with the naked eye. From the appearance of its edge, the snow-cap must have been some hundreds of feet thick. At the west extremity was a high truncated headland, and above this headland to the east was a peak some 10,000 feet high, with a large and apparently inactive crater at its summit. At the east end the land was comparatively low, and, from its blue appearance, at a great distance from us. It was from this part that the dark volumes of smoke issued at intervals. Low down in the eastern horizon were snow-clad pinnacles, only discernible by the aid of the telescope. Outwardly the land exhibited a naked, desolate appearance, a volcanic desert, covered with ice and snow, and so surrounded with ice ejected from the glaciers and forced on to the shores by the north-west current, that it is difficult, if not impossible, to examine the coast very closely. We approached to within 40 miles of the land, and then progress was completely stopped by huge blocks of ice, which had evidently only quite recently rolled down from the lofty peaks. We moored to a floe, and decided to wait until the ice opened up, and so allow the ship to approach closer to the shore. Plans were made for landing the next day, if possible, and it was intended to send a short sledge expedition into the interior to investigate the country. But the next day a gale arose, and the ship was compelled to steer northwards to more open water, as it was dangerous to remain in the vicinity of such heavy ice. A dense fog hung over the sea, completely blotting the land from sight; and so, as there appeared but little possibility of making land in that kind of weather, and there being no likelihood of it clearing, it was decided to abandon the idea and to proceed on our way to Cape

Adare. Thus all our nicely arranged plans made the day before were frustrated.

Towards the evening of January 28, the clouds, which for days had persistently obscured our horizon, lifted and disclosed to our eyes the rugged outline of a mountainous land to the south. Nothing could look more inhospitable. At this time (10 p.m.) the east extremity was bearing S. 26° E. true, and the west extremity S. 45° W. true. Our latitude at noon was $66^{\circ} 46'$ S., long. $165^{\circ} 40'$ E., and variation of compass 30° E.; the land at that time being distant about 40 miles. There is little doubt that the land we sighted was one of the Russel islands discovered by Sir James Ross in 1841. It has been suggested that the Balleny islands and the islands seen by Ross near them were identical. We have proved that they were groups quite apart. The Balleny islands were discovered on February 9, 1839, and consisted of three islands. The west cape of the middle island lay in lat. $66^{\circ} 44'$ S. and long. $163^{\circ} 11'$ E. Buckle island was in active eruption in two places when Balleny saw it. To the east of it lies Sturge island, which is cone shaped, whilst Young island is the largest and highest of the group. Ross's discovery lies more to the south-east. The position of Russel peak on Smyth island, according to Ross, was lat. $67^{\circ} 28'$ S. and long. $165^{\circ} 30'$ E., with which our observations agree. Those observations were very carefully taken in an artificial mercury horizon, placed on the surface of a large icefloe, by Lieut. Colbeck and myself. I have mentioned this in justice to Lieut. Colbeck, whose observations have evidently been miscopied from his original observation book, and have appeared in the recent publication, 'First on the Antarctic Continent,' in a somewhat quaint and unusual form.

The following day being fine, the land was plainly visible. It was not more than 40 miles from us, and was covered with vast piles of snow which never melts, and seems destined to last as long as the world holds together. At the east end of the island a high cape fell perpendicularly into the sea. The west end sloped up gradually from the water's edge to a lofty peak (Russel peak), which, as far as could be estimated, was 10,000 feet high, and, where not covered with snow, terminated in sharp and jagged ridges of a very dark colour. The whole range was of a serrated nature, and the snow-cap extended to the water's edge, whereas on the land we had sighted a few days back it did not. The whole of the north side presented to our view was precipitous, and in some places cliffs between 500 and 1000 feet high fell sheer into the sea; it would have been vain to attempt a landing.

On February 17, Cape Adare (lat. $71^{\circ} 18'$ S.) was reached, a cape of a very dark basaltic appearance, with scarcely any snow lying upon it, thus forming a strong contrast to the rest of the snow-covered coast. This lack of snow is principally due to the very exposed position of the cape to the south-east winds, and perhaps also to the steep and smooth

nature of its sides, which afford no hold for any snowfall. The most striking features of this new world were its stillness and deadness, and impassibility. No token of vitality anywhere; nothing to be seen on the steep sides of the mountains but rock and ice. Here and there enormous glaciers fell into the sea, the extremities of some many miles in width. Afterwards, when the mist had cleared away, more than a dozen were counted around Robertson bay. As we approached, the sounding-line was kept going, but there was deep water close in to the shore. Indeed, there is little danger of finding banks or outlying submerged rocks anywhere along the coast of South Victoria Land. The "Dunraven rocks," indicated on Ross's chart as lying off Cape Adare, and over which, Ross states, the seas were breaking when he observed them, apparently do not exist; for, although a most careful search was made for them during the twelve months we were at Cape Adare, they were never seen. If they exist, they could not have failed to betray their presence during boisterous weather. Could it have been a large rotten submerged mass of ice that Ross mistook for rocks? With the exception of one place where a pebbly bank could be seen, basaltic cliffs rose sheer out of the water to an average height of about 500 feet.

The place upon which we had landed was a triangular-shaped and undulating bank or platform of detritus, the centre of which was about 20 feet above the water-level, and the whole area some 180 acres. It was formed of rounded boulders, pebbles, gravel, and, near the mountain-side, angular masses of *débris*. How this bank first came to be formed is difficult to determine for one who is no geologist; possibly it is the result of glacier action of some kind, or is simply a raised beach. Many stones, however, are blown down from the summit of the cape by the furious winds which sweep over those regions all the year round. The alternate expansion and contraction caused by seasonal and rapid daily changes in temperature is the principal cause in disintegrating the cliffs. The vicissitudes in temperature during the year, more especially during the winter, are at times extreme and astonishing. We have witnessed, in the middle of winter, the temperature alter in a few hours from -35° Fahr. to $+25^{\circ}$ Fahr. Ice forming in the cavities of the rocks, at a few degrees below the freezing-point, exerts an enormous disruptive force. The volcanic rocks, being all porous, in the summer collect much moisture; when the temperature falls, they have their particles pushed asunder by the freezing of the interstitial water. The observed amount of destruction thus caused is enormous; large blocks of stone are split off and launched to the base of the declivities. Some measure of its magnitude in those regions may be seen in the heaps of angular rubbish at the foot of the crags and steep slopes all along the coast. There are many places where soil might form if it were not for the action of the winds, which blow all the finer disintegrated particles into the sea. The winds, blowing with cyclonic

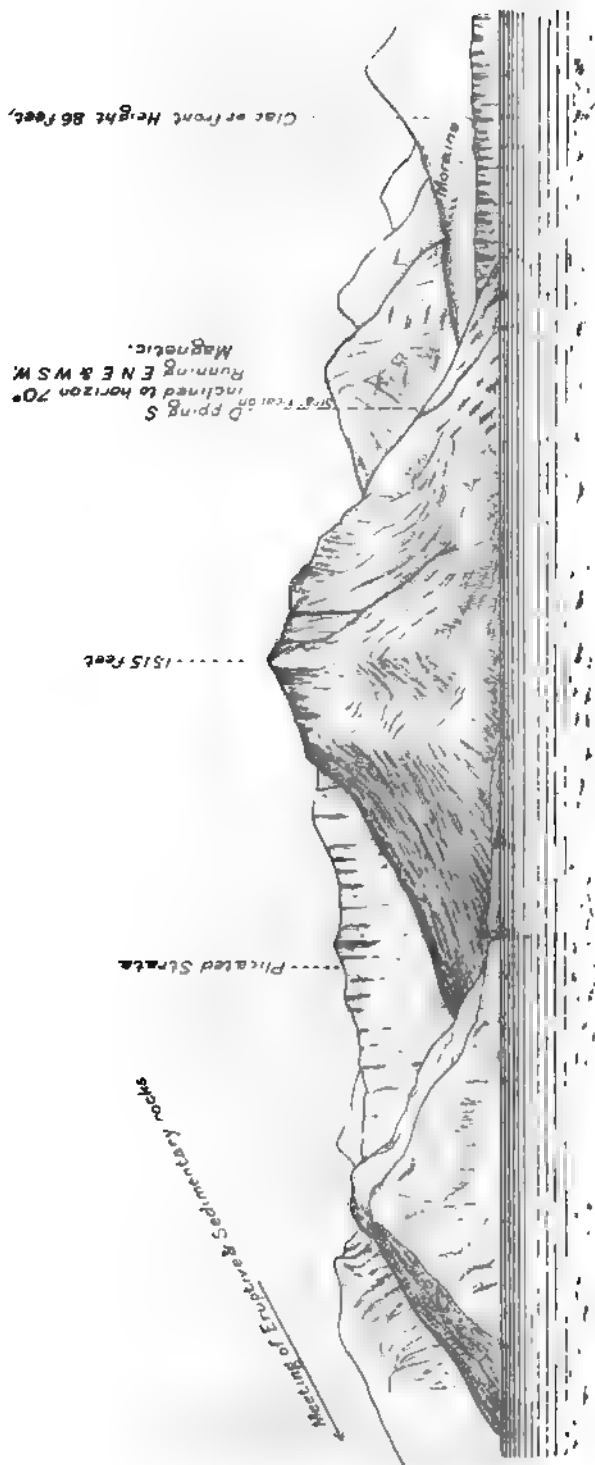
force, are so strong that loose rocks on the face of the cliff are hurled down, and blocks of stone and loose gravel swept away. Gravel and pebbles were heaped up in mounds and ridges. In some places these ridges coalesced so as to enclose basin-shaped hollows, that were filled with strong-smelling liquid matter, which, in the winter, froze solid. Some of these hollows were more than 100 yards in diameter. Bleached remains of thousands of penguins were scattered all over the platform, mostly young birds that had succumbed to the severity of climate. Thousands of years hence, if the species should become extinct, those remains, frozen and buried among the *débris*, will be available as a proof of what once existed in those gelid regions, now just habitable, then, perhaps, not at all. That same night Mr. Evans and I climbed to the summit of Cape Adare (850 feet by aneroid). By following a ridge of craggy rocks we found the climbing tolerably easy, and reached the top in less than an hour. The scene before us looked inexpressibly desolate. A more barren desert can scarcely be conceived, but one of immense interest from a geological point of view. From the end of the cape to the foot of the mountain beyond, a great waste of hollows and ridges lay before our eyes—ridges rising beyond ridges like ocean waves whose tumult had been suddenly frozen into stone. Beds of snow and ice filled up some of these extensive hollows, which had been scooped out by glacier action. Innumerable large erratic boulders lay scattered about, which had, no doubt, been transported to their present positions by the ice-sheets from places many miles away. One huge boulder, which rested on the outer edge of a great basin scooped out of the volcanic rock, was of grey granite, and about 10 feet in girth; some other boulders were of a green formation resembling diorite. In the eroded beds, and among the *débris*, we found numerous pieces of quartz with bluish streaks running through them. I was especially struck by its resemblance to some auriferous quartz met with in Australia. We also picked up pieces of pink and red granite, and a hard greyish stone of the consistency of flint.

I wish to refer here to a statement made after the return from the south polar seas of the whaling ship *Antarctic* in 1895, to the effect that "the intercalation of lava and ice had been observed at Cape Adare, and that in one place the lava-flow appeared quite fresh." This statement has been very widely accepted as authentic. Sir Archibald Geikie has referred to it in numerous geological papers, more especially in his address before the Antarctic Congress in 1898. Dr. Karl Fricker also makes mention of it in his work on the antarctic regions. Unfortunately, the statement is absolutely without foundation, for there is no sign of the intercalation of lava and ice in the old eruptive formation at Cape Adare, nor anywhere else along the coasts of South Victoria Land, unless it be in the vicinity of Mount Erebus.

As we are dealing here exclusively with the topography of the

antarctic lands, I will pass over everything which is not related to the subject. On August 14, 1899, a sledge party set out from the hut at Cape Adare for the purpose of exploring the southern extremity of Robertson bay. No doubt it would have proved more valuable and interesting to have investigated the shore-line in the direction of Smith's inlet and Cape North, and examined closely the whole contour, which might have yielded geographical and geological discoveries of much value. Besides this, the accurate astronomical positions of headlands, inlets, glaciers, etc., could have been laid down, and soundings taken through the numerous open seal-holes. We reached what we thought to be our destination very late at night, and camped between two walls of ice. These walls of ice puzzled us considerably, and it was not until the following morning, when we had climbed to the summit of one of these barriers and were able to get a view of our surroundings, that we discovered we had steered a wrong course during the previous night, and, in the darkness, had run into a kind of inlet between two huge tongues of ice 5 or 6 miles further down the coast—a veritable *cul-de-sac*. These tongues of ice, which were the seaward prolongation of two great rivers of compact crystalline ice creeping down from the deep mantle of snow and ice enveloping that polar land, extended out into the bay for a distance of 3 miles, and were, perhaps, half a mile broad. Two glaciers traversing convergent valleys united at a point about 6 miles above one of these tongues, and the lateral moraine stuff, which could be easily traced on one side of each, coalesced and formed a broad and conspicuous medial moraine down the centre. Much of the moraine rubbish, however, was concealed by the loose snow on the surface. I measured the height of the ice-ramparts in several places by carefully marking out a base-line on the frozen surface of the sea, and observing the angles of elevation with the sextant; the average height was about 90 feet. Of course the icebergs formed in Robertson bay do not attain anything like the dimensions of those drifting up from farther south, where the glaciation is so much greater. On the lee side of the ice-tongues great piles of snow-drift were accumulated by the east-south-east winds, and heaped up almost on a level with the summit of the wall. The sea-ice around the extremities of the tongues was very little cracked or crushed together, thus indicating that the movement of the glaciers was not, at that time of the year, very considerable.

The glaciers of the antarctic do not, I think, move rapidly at any time of the year. In this respect they are very different to those of Greenland, some of which, I believe, are the most rapid moving glaciers on the surface of the globe. No actual measurements on the rate of motion of the glaciers of South Victoria Land have been made, so that nothing positive respecting them can be advanced. Sharp detonations, however, were frequently heard, showing that there was some movement going on in the mass.



SKETCH OF LOCALITY IN SOUTH END OF ROBERTSON BAY, WHERE SLATE FORMATION BEGINS.

The spot where we ultimately camped was a small islet, which has been named Duke of York island, and which is, perhaps, 3 miles in circumference, and surrounded by a glacier that nearly conceals its insularity. The geological formation consists of a greenish slaty rock of very fissile structure, which is on the whole intensely crumpled and plicated. Crystals of pyrites occurred disseminated throughout the formation, in some places in great abundance. The pyrites appeared in small cubical perfectly opaque crystals, which, with reflected light, showed the characteristic brassy lustre of the mineral. These crystals appeared to yield but slowly to weathering, for generally the cubical crystal could be seen projecting still fresh from the stone, which had no doubt been long exposed to the atmosphere, and a small blow would, in many cases, loosen the entire crystal from the rock. The formation was here and there traversed by thick veins and narrow threads of quartz, showing strong evidence of disturbance, and seemed to have been exposed to a powerful lateral pressure; this quartz contained bluish and rusty-coloured streaks. In the crevices of the slate rock a dark soft soapy substance something like graphite was found. In some places the stratification formed roads on the side of the mountain some 30 or 40 feet in width; in other places the greenish colour of the formation was changed to a dull brick-red, as if it had been under the influence of heat. Whether this is really caused by heat or is merely the ordinary effect of weathering, I do not know; I think the latter cause is the most probable. These red patches were conspicuous some miles away, and were exactly similar to the formation around them, and, relatively, in no way disturbed. The slaty formation extended as far north along the coast as we examined, which was about 5 miles, the general inclination of the stratification being about 60° , and dipping south. How interesting, from a geological point, it would have been to follow the formation round towards Cape North!

At a place about 2 miles south of the islet, and right in the bottom of Robertson bay, a dark eruptive rock of very great density and very hard flowed over the sedimentary formation, and thus completely hid from view its southern prolongation. It probably continues underneath the lava-flows towards Mount Erebus. At Wood bay it will probably be found outcropping again on the surface. This sedimentary formation is of immense interest; it appears to continue north towards Wilkes Land, for Dumont D'Urville found slate rock at the place where he landed in the neighbourhood of "Pointe Géologie," and it possibly underlies most of the volcanic rock of the antarctic lands. This slate formation also appears among the islands south of Cape Horn. The geology of the antarctic is a subject replete with interest for the connoisseur. In the extensive sedimentary deposits fossils might be found with indications of a warmer climate during some former epoch.

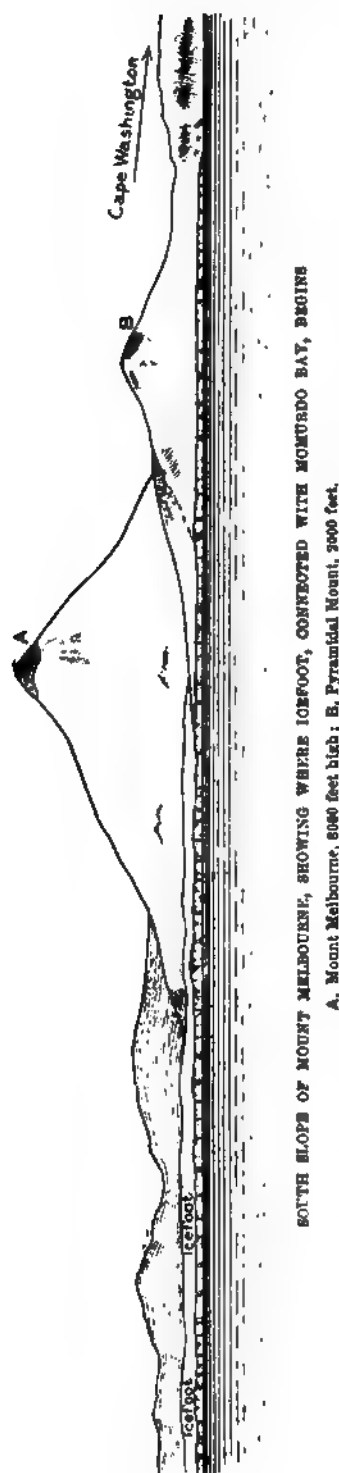
An attempt made at this time to cross the mountain range was

unsuccessful. Indeed, it became evident, soon after our landing at Cape Adare, that any attempt to penetrate far into the interior would be futile, owing to the rugged and precipitous nature of the mountains which had to be crossed before reaching the inland ice visible beyond. The Admiralty range of mountains in Robertson bay is the most formidable range in South Victoria Land. Rising to an average height of about 7000 feet, and partly free of snow on its northern slopes, it presents an impassable barrier to a sledge-party. The greatest altitude we succeeded in reaching was 5200 feet, a little to the south of Cape Adare.

On January 28, 1900, the *Southern Cross* returned to Cape Adare, and on February 2 we were all on board and steaming southwards along the coast. The coast-line from Cape Adare to Cape Downshire is exactly similar to that of the north shore of Robertson bay; the same igneous formation, with precipitous cliffs, and here and there pillars of rock standing out a short distance from the shore.

Early on the following morning a landing was effected on a rough pebbly beach on the western side of Possession island. This island, which is the largest of a small group, is low—the highest part, a peculiar abrupt bluff on the south side, being about 300 feet high. It is almost entirely covered with a snow-cap averaging from 1 foot to 20 feet in thickness, and the whole island is, I should say, about 4 miles in circumference. Many large rocks were observed to the south of the larger island, two being basaltic pillars rising sheer out of the sea and attaining a height of about 100 feet. In another rock the sea had perforated three arches, one so large as to almost admit the passage of the ship. Towards noon we were off Cape Rogel. A large body of ice lay off it and at the mouth of Mowbray bay, so we were compelled to make a long *détour* towards the east to avoid it. In the afternoon Capes Christie, Cotter, and Hallet were passed, all bold rugged headlands of volcanic formation, and partly free of snow.

Coulman island was reached on the 4th. The shore on the western side looked so precipitous, that at first we entertained but little hope of effecting a landing. At one place a perpendicular cliff, some 1500 feet high, fell sheer into the sea; to the right and left were the walls of the ice-cap, about 100 feet high, and extending for some distance out into the sea. After some risky manœuvring in the surf, we succeeded in landing at a spot at the base of the cliff. There was, however, nothing to see except the walls of the cliff, the formation of which is volcanic and similar to that at Cape Adare. On the mainland, about 14 miles due west of Coulman island, we discovered a kind of inlet or arm running into the glacier for a distance of about 3 miles. This spot was well sheltered from winds, and from it the inland ice-cap was easily accessible; but it was scarcely safe for a ship, on account of the heavy ice-pack, which is borne by the current into the channel between Coulman island and the mainland.



SOUTH SLOPE OF MOUNT MELBOURNE, SHOWING WHERE ICE-FOOT, CONNECTED WITH MCMURDO BAY, BEGINS
A, Mount Melbourne, 8000 feet high; B, Pyramidal Mount, 3000 feet.

At noon on February 6, Mount Melbourne was sighted to the west-south-west. We were all struck by its extraordinary resemblance to Mount Etna. Rising up gradually out of the sea to an altitude of nearly 8000 feet, with a canopy of cloud upon its peak, it presented an imposing sight. All afternoon we steamed down Wood bay, which runs much farther inland than indicated on Ross's chart; at the bottom of it there is a long inlet or fjord, affording a capital harbour. Late in the evening, we landed on a pebbly beach at the foot of Mount Melbourne. The place upon which we landed was a pebbly bank even larger in extent than that at Cape Adare, entirely free from snow and "ponds" and occupied by penguins and skua gulls. A better spot for winter quarters, I think it would be difficult, if not impossible, to find in those latitudes. It is the only place in South Victoria Land where a ship can winter with perfect security. From here there is quite an easy access to the great snow-cap, not more than 100 feet to climb, and a very gradual gradient. This part of the coast is actually the closest approach to the south magnetic pole, it lying in an almost westerly direction from Wood bay distant between 200 and 300 miles. I do not, however, wish to imply that observations can be taken in the vicinity of the magnetic pole without much difficulty, for it is quite within the bounds of possibility that an open sea may be encountered before reaching a distance of 200 miles in a true westerly direction—that is, if an archipelago of islands exists, instead of a vast continental area.

If a land party should winter near Mount Erebus and Terror there is an easy way of communication between such a party and a ship wintering in Wood bay by means of an uninterrupted ice-foot, which, commencing from the southern slopes of Mount Melbourne, continues southwards as far as McMurdo bay. The surface of this ice-foot is perfectly level,

covered with hard compact snow, and is but little crevassed, as was actually determined by two landings upon its surface in the vicinity of Cape Gauss, which is itself buried in the ice-sheet.

The distance between McMurdo bay and Wood bay is about 170 miles, which, with sledges and dogs, and such favourable conditions of ice-travelling, could be covered in eight days. The surface of this ice-foot is easily reached from Wood bay by going round the foot of Mount Melbourne from behind. The geological formation here was volcanic, but not compact or magnetic rock. It consisted mostly of scoriæ, no doubt ejected from Mount Melbourne, which, most probably, was at one time a volcano in activity. Some pieces of slate were seen on the beach, but, being engaged in taking magnetic observations, I had no time to search for any outcrop of this formation. The observed height of Mount Melbourne is 7200 feet. It is entirely snow-clad, and rises directly from the sea. The bare rocks at the foot of the mountain have weathered into many fantastic shapes.

On February 9, we landed without difficulty on the western side of Franklin island, on a pebbly bank similar to that in Wood bay and at Cape Adare. The whole island is of volcanic formation, one heavy greenish vitreous rock being especially interesting. From Franklin island we steered straight for Mount Terror, without approaching McMurdo bay, a close examination of which would have been of much value, for possibly there is a spot on its shores where a party might be able to winter; but the discovery of a sheltered inlet where a ship could safely winter is, I think, extremely improbable. On the 10th we sighted Cape Crozier and Cape Bird and the foot of Mount Erebus and Terror, but the dense masses of clouds wholly obscured all but the immediate coast-line. At the foot of Mount Terror we lay to for some hours in the hope of getting a glimpse of the summit of Mount Erebus, and procuring a photograph. But as the pall of clouds showed no sign of breaking, we waited no longer, and steamed on towards Cape Crozier, which we passed a little before midnight. I must mention, however, that on the afternoon of the following day the mist lifted for a short time, and enabled us to see Mount Erebus from the deck. Smoke could be easily distinguished arising from its snow-clad summit, so that it was evidently not quiescent; but whether it was in a state of eruption, as at the time of the visit of Sir James Ross, we could not distinguish, being too far away. It was a most cursory and imperfect glance that we got, for the dense mist soon closed down again. The light was too bad and the distance too great to procure a photograph of the volcano.

Soon after passing Cape Crozier, the mist rose from Mount Terror, and we obtained a fairly good view of it from base to summit. It is, of course, very lofty, but scarcely looks the height (10,884 feet) Ross assigns to it. Strange to say, its eastern side was almost free from snow, and on the same side were numerous knolls, some having

mouths, and which at one time were the monticules of the parent volcano, now apparently extinct. Even stranger than the absence of snow on Mount Terror was the presence of an exceedingly large penguin rookery at its foot. This rookery was occupied by millions of penguins, and was far and away larger than any we had previously seen.

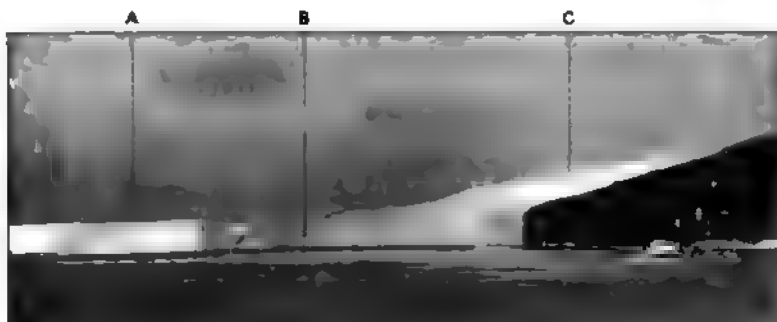
The foot of Mount Terror is low, and at the spot occupied by the penguins there is a kind of miniature plateau upon which a party could possibly spend a winter, although, I believe, it would be an extremely severe one. One of the greatest difficulties, if not the greatest, would be the excessive cold to be contended with, for even in the middle of summer, with a wind from the south, the temperature sinks considerably below zero; thus, on February 19, with a light wind from the south, the temperature fell to $-12^{\circ}5$ Fahr. What, then, must we expect in the depths of winter with the wind from the same direction?

After having passed Cape Crozier, Ross's great ice-barrier came in view, stretching away out of sight towards the east. Scarcely any natural feature of the antarctic world has so stirred the imagination and so roused scientific interest as the discovery of this great ice-barrier. The most surprising characteristics of the great ice-barrier are its unbroken uniformity, its vast extent, and the entire absence of visible land from its edge. Imagine a perpendicular wall of ice, from 100 to 200 feet high, suddenly rising up before you out of the ocean, where the depth of that ocean is measured by hundreds of fathoms, and hundreds of miles distant from any visible land, for you soon lose sight of Cape Crozier and Mount Terror. There are no breaks in this wall, and it is very little water-worn, proving the rare occurrence of gales from the north and the accompanying high seas, which would otherwise wear huge caves into it; its summit affords absolutely no obstacle for travelling with sledges and dogs, being smooth and level and but little crevassed.

A theory has been advanced and very widely accepted that the great ice-barrier is the front of a huge polar ice-cap, which moves from the south pole northwards. It has even been calculated that the centre of this polar ice-cap must be 3 miles, and may be 12 miles deep, and that, the material of this ice-mass being viscous, its base must spread out under the crushing pressure of the weight of its centre, and the extrusive movement thus set up is supposed to thrust the ice-cliffs off the land at a considerable rate. The improbability of this theory is evident to any one who has carefully observed the barrier and the ice-caps of that part of the antarctic, none of which can possibly be more than 2000 feet in depth. The following theory with regard to the formation of the great ice-barrier I hope may bear logical scrutiny.

In the first place, reasoning from analogy, all the ice-sheets of South Victoria Land, due to the north and south trend of the lofty mountain ranges, flow towards the east, and the glaciers extend for long distances

into the sea in the form of huge tongues of ice, their length varying according to the extent of glaciation due to differences of latitude. Thus, in Robertson bay (lat. $71^{\circ} 18' S.$), some run out into the sea for a distance of 3 miles, and are half a mile in width; whilst near Cape Gauss (lat. $76^{\circ} S.$) they extend as far out as 30 miles, and are 4 or 5 miles across. These tongues of ice are characteristic of every glacier. Why should the great ice-barrier be an exception? The huge Parry range of mountains runs parallel with the coast, and appears to be simply a continuation of the coast-line, for there is absolutely no land in sight to the east of them. It follows that the ice-sheet, which covers these mountains and where the glaciation attains its maximum dimensions, must flow eastwards in the same direction as it does a few miles to the north of them. If the ice flowed northwards from the south pole, the ice-barrier near Cape Crozier would extend out into the sea, just as do



CAPE CROZIER, LAT. $77^{\circ} 25' S.$, LONG. $169^{\circ} 10' E.$

A, iceberg; B, height nearly 200 feet; C, Crozier and the great ice-barrier

all the glaciers of South Victoria Land; but this is not so. The edge of the barrier is at least half a mile behind Cape Crozier. Again, the surface of the ice-sheet would gradually rise from the edge towards the south. It does not, but rises from the east towards the west. Then it is evident that the great ice-barrier moves from the west towards the east. Therefore it appears as if the great ice-barrier is nothing more than a huge tongue of ice flowing eastwards into the ocean for a distance of perhaps 500 miles, and is possibly not more than 50 miles in width; so that, if the party from the *Southern Cross*, that landed on the barrier in lat. $78^{\circ} 34' S.$ and long. $164^{\circ} 32' W.$, on February 17, 1900, had continued their journey farther south, they might have come to an open sea on the other side.

The heavy ice-pack met with near this spot tends to prove the existence of a considerable track of ocean to the south, whose frozen surface only breaks up late in the year and moves out and around the extremity of the great ice-tongue or barrier in the usual north-westerly direction. If an extensive land area were behind, or farther east, such

a large mass of sea-ice would be impossible. Sir James Ross reported the "appearance of land to the south," near the spot where we landed on the barrier. We did not, however, sight any land, although we had exceptionally fine clear weather. I do not wish to imply that it does not exist, possibly it does, and is either an island or the eastern shore of a large deep bight extending from Mount Terror around towards Graham Land; but I do believe that there is an open sea between the southern side of the great ice-barrier and that land, if it exists.

There is one thing that appears to go against the above theory, and that is the comparatively shallow water found at the spot where we landed on the barrier, viz. 350 fathoms. But can we reasonably expect to find deep water near the south pole, where everything tends to prove the existence of an archipelago of large islands? The few indications which we possess of the depth of the ocean in this part of the world, seem to indicate that there is a gradual shoaling of the ocean from very deep water towards the antarctic lands. The ice-barrier in long. 164° W. is distinctly different in appearance to that observed further west. Its outlines were more broken and full of indentations; the elevation, too, was no more than 60 or 80 feet. The fact that the position of the ice-barrier where we landed upon it was found to be many miles further south than reported by Ross is possibly due to a large portion of the barrier having here broken off and drifted away in the form of huge icebergs. Or, again, Ross might not have approached the barrier very closely at this particular spot, his highest south point being 30 miles more to the east.

Before the reading of the paper, the PRESIDENT said: I think I can promise you a very interesting paper from Mr. Bernacchi. He is a young independent observer, and I think a very shrewd observer, and he has had the great advantage of observing in a most interesting part of the antarctic regions which has not previously been visited for nearly sixty years. I will ask Mr. Bernacchi to read his paper on the Topography of South Victoria Land.

After the reading of the paper, the PRESIDENT said: In introducing Mr. Bernacchi, I forgot to mention what I had promised to state, namely, that the reading of Mr. Bernacchi's paper had the full consent of his former chief, Mr. Borchgrevink. We hope that Sir Joseph Hooker may be disposed to make some remarks on the views expressed by Mr. Bernacchi.

SIR JOSEPH HOOKER: I have listened with very great pleasure to this most interesting and clear account of Mr. Bernacchi's of the phenomena that he has witnessed in the antarctic seas and lands. So far as my very vivid recollection carries me, they precisely agree with what I saw myself now upwards of sixty years ago, put in a very clear and most instructive manner. Of course, the great interest of the voyage and observations is that great ice-barrier. That ice-barrier, I think I may safely say, presents the most remarkable unsolved glacial problem in the world, and there has been really no satisfactory explanation given of it. That which Mr. Bernacchi has put forward, which he very wisely regards as a mere speculation, is a very ingenious one, and it may be a true one, but it is exceedingly difficult to conceive any amount of *névé* in the

Parry mountains driving a body of ice of that dimension over 300 miles. It is practically a plane surface, and we know nothing like it in any other part of the world. Then, again, with regard to there being water on the southern slopes of this barrier, is it not a fact that on no occasion did Mr. Borchgrevink see anything like a water-blink in the sky in that direction? If there had been much water within any reasonable distance to the southward, I think we could not fail to perceive a water-blink in the sky. These are the only remarks I have to make.

The PRESIDENT: Mr. Bernacchi allows about 50 miles of width.

Sir JOSEPH HOOKER: Yes. I should like to ask Mr. Bernacchi if Mr. Borchgrevink's party saw any appearance of these mountains seen by Ross from the extreme eastern edge of the barrier?

Mr. BERNACCHI: No, none at all.

The PRESIDENT: Were you as far east as Ross?

Mr. BERNACCHI: No; within 30 miles of Ross.

Dr. BLANFORD: I have not had time to look at the geological specimens exhibited by Mr. Bernacchi; but the additional facts that have been obtained concerning sedimentary rocks and their resemblance to some of the Australian rocks are very interesting, and will lead to further identification. Of course, the most interesting fact about the antarctic land area is the probability that this at one time has formed part of either South America or Australia, or probably of both; because if it was not land at one time, and land which was not entirely covered with ice, it is very difficult to understand how some curious connections between the animal life of South America and Australia can have originated. The fact that one of the great groups into which the marsupials are divided is only represented in South America and Australia, is in itself extraordinary; and it appears, from some recent observations, that the number of South American forms allied to the Australian marsupials is much greater than we in past times supposed. Then another curious fact is with regard to the horned tortoise *Miolania*, of which remains have only been found in Australia and South America. There are other points of connection in past times, and there is quite sufficient similarity between the faunas of the two areas to make it highly probable that at one time, when, perhaps, the southern hemisphere contained more land than it does at present, and the northern contained less, there was land union between South America and Australia. I think that the interest attaching to the glaciers and the ice-barrier is also a geological question. Just as one of the most important discoveries of the century was made when Nordenskiöld penetrated into the interior of Greenland, so I think it is very probable that some equally important discoveries remain to be made when we know something of the interior of the antarctic land. Whether it is a continent or merely an archipelago of large islands, is one of the questions that remain to be solved in the antarctic area, and the exceedingly novel and interesting views which Mr. Bernacchi has brought before us about that enormous mass of ice throw an entirely new light upon the whole subject. The ice may be either the edge of a great glacier coming down from the land to the south; or it may be, as Mr. Bernacchi has suggested, a mass of glacier ice pushed out to sea, or it may be a mass of floating ice filling a sound between two large islands. It is very satisfactory to hear that it can be easily explored; and if it can be penetrated from 150 to 200 miles, it will at once be shown what its real nature is. If it is a glacier, the surface will rise rapidly towards the south; if it is a floating mass pushed off from the land, the surface will not rise rapidly, but will probably remain for a considerable distance very nearly at the same level.

Admiral Sir GEORGE NARES: With regard to Robertson bay, we are told of a remarkable double tongue of compact crystallized ice. Can Mr. Bernacchi tell us, was that likely to have been a summer river either at the spot or further back, and that it has been pushed forward by the glaciers?

Mr. BERNACCHI: No, I do not think so.

Admiral Sir LEOPOLD M'CLINTOCK: May I ask the lecturer if he would kindly give us some information of the animal life to be found far south, as it is very important to know whether food could be obtained for men or dogs who might have to pass the winter there. You mentioned penguins, but I take it they only visit the coast in the summer season?

Sir ERASMUS OMMANNEY: I should like to ask whether you made any exploration along the coast to the westward of Cape North, or did you see beyond that anything like the ice-barrier which was observed to the eastward? I presume the exploration of the coast was made under sea navigation, wasn't it?

Mr. BERNACCHI: Yes, most of it.

Sir ERASMUS OMMANNEY: Did you make any use of the dogs?

Mr. BERNACCHI: Oh yes, in Robertson bay only. In reply to a remark of Sir Joseph Hooker with regard to the Parry mountains, I may say the snow-cap on the mountains is, I think, sufficient to force such a large mass of ice as the great ice-barrier towards the sea. We must remember that there are no slopes to the west of the mountain ranges in South Victoria Land, that there are only slopes to the east, and that there is a large body of snow and ice moving from the west right over the summits of the mountains, so that that would be quite sufficient to force a large mass of ice eastwards. Then, in reply to a question put by Admiral Sir Leopold M'Clintock, of course I am not very conversant with zoology or with animal life, but I can say there are no land animals to be found in South Victoria Land; but there are plenty of seals along the shore-line, both in summer time and winter, and they are always available as food for dogs and human beings, and the penguins, which can be procured during four months of the year, are also available as food for sledge-parties. And then I think Sir Erasmus Ommaney asked a question with regard to explorations in the direction of Cape North. I am very sorry to say that no expeditions were undertaken towards Cape North. I do not know for what reason. The commander was requested to allow permission to undertake expeditions to Cape North by various members of his staff, but for some reason he did not grant that permission. There is no doubt we could have undertaken these expeditions, because the surface of the ice was not hummocky in that direction, and was perfectly secure, and remained so until late in December. And then with regard to an ice-barrier to the west of Cape North, of course I have not seen the barrier, and know absolutely nothing about it, but I believe the barrier was seen by Wilkes and Dumont d'Urville. In the first place, I think some of Wilkes' ice-barriers and lands are extremely improbable. Sir James Ross has proved that some of his lands did not exist, so also did the expedition of the *Challenger*. Of course Dumont d'Urville was more reliable, and there is no doubt there is an ice-barrier from Cape North westward, and I believe the length of it is about 90 miles. We can account for that in the same way as we can account for the great ice-barrier, for I believe most of the mountain ranges seen by Dumont d'Urville run north and south, not east and west, and appear to be a continuation of the Australian continent, for nearly all the mountain ranges in Australia and New Zealand run north and south. And then the same theory of the ice-tongue moving from the mountain slopes would apply to that ice-barrier, as it does to the great ice-barrier. Of course, there is no doubt that a very large field for exploration still remains in the antarctic regions, and the expeditions of the *Southern*

Cross and the *Belgica* have not added very much to our actual geographical knowledge of these regions. The expeditions which are about to sail from England and Germany have a field for exploration greater than the whole of Australia, and the scientific results which would accrue from the exploration of so extensive and unknown a polar track must be very great; and surely we cannot boast of any brighter chaplet than that which has been gained in the field of scientific and geographical research. Explorations in the antarctic can have little commercial value, for a more barren spot could scarcely be conceived. As for gold—well, in the first place, you have got to find it, a most unenviable task, and you would fully deserve it if you were successful. But I do not think any rational-minded person would for a moment entertain so wild and picturesque an idea as that of discovering a second Eldorado in South Victoria Land.

The PRESIDENT: There were glittering stones, were there not?

Mr. BERNACCHI: Yes, but I don't think it was gold. Nor would the most ardent advocate of imperial expansion look to the territory surrounding Mounts Erebus and Terror as a sphere for his ideas.

The PRESIDENT: I think I may congratulate the meeting on having listened to an extremely interesting paper, and also an important paper from a geographical point of view. In the first place, the lecturer appears to have cleared up the question respecting the difference between Russel islands and Balleny islands. Then he has given us a clearer description of Robertson bay and Cape Adare and Duke of York island than we had previously received. His description of the excellent winter quarters in Wood bay is important. And it must be very gratifying to Mr. Bernacchi to find that his theory respecting the great ice-barrier has received the attention of Sir Joseph Hooker and Dr. Blanford, who have both expressed, at all events, their very great interest in it. I am sure you will all cordially pass a vote of thanks to Mr. Bernacchi for his very interesting paper.

SURVEY OF THE SOBAT REGION.*

By Major H. H. AUSTIN, D.S.O., R.E.

IN the autumn of 1899 two survey parties left England for the Sudan, with the object of surveying (1) a tract of country from Roseires on the Blue Nile, in a southerly direction down to the Sobat or Baro river; and (2) the Sobat river and the country lying between it and the north of Lake Rudolf.

The former survey party was under the command of Major C. W. Gwynn, D.S.O., R.E., who was accompanied by Lieut. L. C. Jackson, R.E., whilst the latter survey was entrusted to me, assisted by Major R. G. T. Bright, of the Rifle Brigade.

Major Gwynn and Lieut. Jackson accomplished a most successful and interesting journey, and accurately surveyed tracts of country hitherto but little known, as they entered regions never before visited by Europeans.

I do not propose, in this paper, to deal with Major Gwynn's

* Read at the Royal Geographical Society, March 25, 1901. Map, p. 572.

expedition, as I hope, on his return to England, he may be prevailed upon to give some account himself to the Society of the most valuable geographical results obtained by him and Lieut. Jackson. I shall merely confine myself, therefore, to giving a brief outline of the work done by Major Bright and myself, with some notes on the country passed through by us and the natives met with.

We left Omdurman at the beginning of December, 1899, in one of the Sudan gunboats, which towed a double-decked barge and two sailing-boats, in which were accommodated our escort of 22 Sudanese and 25 animal attendants, as well as the whole of our transport, consisting of 7 camels, 10 mules, and 130 donkeys. We proceeded up the White



NUER VILLAGE ON RIVER SOBAT.

(Photo by Major R. G. T. Bright)

Nile past Fashoda, until we reached Sobat Fort, at the junction of the Sobat with the White Nile. We then steamed up the former river until we reached a point beyond which we were unable to proceed owing to the lowness of the river at that time of the year, and there disembarked—about midway between the Sobat and Nasser posts. As the transport animals had been confined on board for close on three weeks, and had lost condition considerably, we halted for a week at the point of disembarkation (near the village of Ashel), in order to admit of their picking up strength, and during this time the loads, etc., were packed into their saddles and all arrangements completed for the land journey. The course of the Sobat from Sobat Fort to the



BLUE NILE EMERGING FROM ABYSSINIAN HILLS, 20 MILES EAST OF FAMA.

(Photo by Major C. W. Gwynn.)

point of disembarkation was surveyed from the steamer, and the traverse thus obtained fitted in between points fixed astronomically when the steamer was tied up for the night. In this portion of the river only one tributary joins the Sobat. This is known as Khor Filus, and enters the south or left bank of the river some 10 or 11 miles above Sobat Fort. It is some 30 to 40 yards in width, and is said to be merely a loop of the river, the exit from the Sobat being near the village of Nyangdeng, which we crossed subsequently during the land journey.

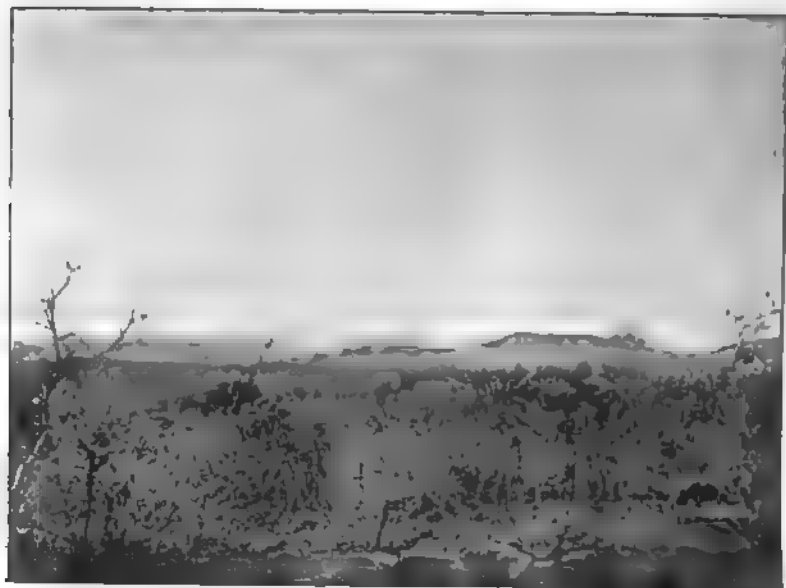
Ashel is the first village of a small section of the Nyuak or Anuak tribe, who inhabit the river-bank as far as Wegin, whence the powerful Nuer tribe occupy both banks of the river as far east as about E. $34^{\circ} 10'$, thus separating the two sections of the Nynuaks.

From Sobat Fort as far as Amajok village, both banks of the river are inhabited by Shilluks. The Dinkas then intervene between the Shilluks and Nynuaks, numerous villages existing along the river throughout Shilluk and Dinka territory as far as the village of Lajak, after which come some 15 to 20 miles of uninhabited country along the river until Ashel is reached. The Dinka territory for the most part consists of open treeless grass plain; but the natives appear rich in herds of cattle, and possess numerous flocks of goats and sheep.

The disembarkation camp near a single Dom palm tree on the left

bank of the river Sobat was abandoned on December 28, and the land journey commenced to Nasser Post, which was reached on January 4, 1900. The country traversed along the left bank was generally well wooded and thickly populated, more especially in the Nuer territory, where tracts of fine park-like country were crossed, as well as large areas of cultivation in the immediate vicinity of the numerous villages. The inhabitants are, however, very low types of humanity, and although their huts and villages are well-made and substantial, the people themselves are indolent, suspicious, and depraved, and yet by no means unfriendly. Physically the men are tall and well-made, and have a high reputation for courage amongst the other tribes. They are all stark naked, and, as protection against cold, smear themselves from head to foot with wood-ash, which gives them a particularly filthy appearance. They are all well armed with spears, of which every man carries two or three in addition to a knobkerry, whilst their weapon of defence consists of an oval-shaped buffalo-hide shield. The elder married women are as filthy in appearance as the men; but all wear a leather apron or skin fastened round their waists. The girls and unmarried women do not, as a rule, smear themselves with wood ash, but, like the men, are quite naked.

Shortly before reaching Nasser another large khor is crossed on the south bank near the village of Tolor. This is reported to be the Khor Geni, which flows out of the Pibor river, some $6\frac{1}{2}$ miles below the



GOMASHA PLATEAU, LOOKING NORTH TO THE LARGER OF THE TWO GULE PEAKS.

(Photo by Major C. W. Gwynn.)

junction of the Akobo river with the Pibor, thus forming another loop. These loops are, I think, one of the most curious features of the whole of the Sobat region, and a glance at the map will show what strange and unlooked-for courses the streams take in this swampy country when the rivers have overtopped their banks. Time after time during our wanderings we came across places where a branch would take off from the main stream for no very apparent reason, and, after careering about across country by a course of its own for many miles, would gradually find its way back to its original parent, or into another river. The country is so flat, and as generally there is nothing to indicate the course of a river, it is often quite impossible to even make the



VIEW ON ABYSSINIAN PLATEAU.

(Photo by Major R. G. T. Bright.)

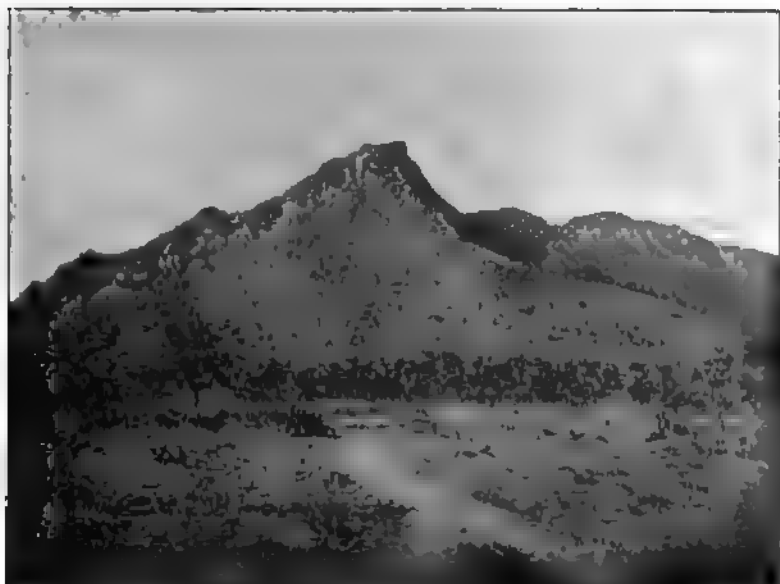
wildest guess as to where a stream is likely to go to, and, in consequence, native information (generally of a most unreliable nature) had occasionally to be accepted. The presence of streams, even when only some 50 or 100 yards distant from the line of march, was not unfrequently quite unknown to the survey party until we suddenly found ourselves right on the bank. The Adura river is the most important loop in this region, as this is really a very large one; though found to be quite unnavigable, it is often over 100 yards in breadth; but its bed is full of islands and sandbanks.

The position of Nasser Post, as now shown on the map, may be taken as the correct one, for Major Gwynn's position for it, working from

Omdurman along the Blue Nile and then south, agreed within a few hundred yards of that obtained by me by the White Nile and Sobat route from Omdurman. In the neighbourhood of Nasser the right bank of the Sobat is densely populated as far as the junction of the Sobat and Pibor rivers. The left bank is uninhabited, as nearly all that portion of the country is inundated when the rivers are full.

We left Nasser on January 7, and the following day arrived at the junction of the above-mentioned rivers. A crossing was effected on January 9, a short distance up the Pibor, which at that point was about 100 yards wide, and divided into two channels by a small island. We now entered a treeless region, and as all the tall rank grass had recently been burnt by the natives, we experienced some difficulty regarding fuel. Two days later we reached the point where the Adura river re-enters the Baro (as the Sobat is called above the Pibor junction) after an independent course for 40 or 50 miles. Here the Adura was from 100 to 120 yards in width; but fortunately fordable at that time of the year. We continued for several days longer through a most dreary and uninteresting country along the Baro. Not a tree, and scarcely a shrub, was to be seen, to break the dull monotony of the country, and the distant hills were invisible owing to a dense heat haze. All this country is one vast swamp when the rivers are full, and is then quite impassable for transport animals. At length, on January 16, we struck across country to the Adura river, and followed that river up to its exit from the Baro, which we reached the following day; thereby conclusively proving the Adura to be merely a loop of the main stream. South again of the Adura there is reported to be another river, the Mokwai, which is said to be a fine river in its lower reaches, although its exit from the Baro, some 5 or 6 miles above that of the Adura, is a most insignificant one, and barely discernible, as it is so overgrown by tall shrubs. This river is said to be joined by another stream known as the Bela, which we crossed subsequently on our journey south, and the combined streams then enter the Pibor some 10 to 12 miles above its junction with the Sobat. It was found navigable for some 20 miles up stream, by Major Capper, in 1898, but the steamer was then stopped by "sudd."

Above the exit of the Adura the banks of the Baro are well wooded, there existing in places a regular forest-growth of sycamore and other trees. Near the village of Methok, which is the limit of Nuer occupation on the left bank of the Baro, a big stream, known to the Nyuaks as the Aluro, and to the Nuers as the Nigol, spreads out into a large swamp, and finds its way by insignificant channels through a thick forest-growth into the Baro. It has its origin in the Abyssinian highlands, and constitutes a most formidable obstacle, for large expanses of both banks are converted into swamp when the river is full and over-tops its banks. We later on spent three days floundering through this



TYPE OF HILLS OUTLYING THE EDGE OF ABYSSINIAN PLATEAU.

(Photo by Major C. W. Gwynn.)

swamp, when we struck south from Nyuak country on our way to the river Gelo, after the rains had broken.

Shortly after crossing the Nigol river, we entered the territory of the Anuaks, or Nynaks, who inhabit both banks of the Baro, or, as they call it, the Upeno river, as far east as the foot of the Abyssinian escarpment, whence it issues out through a deep gorge on to the open plains. This portion of the river is the most fertile and attractive anywhere along its course through the plains. The country is well wooded, to a large extent free of those large expanses of swamps so general in Nuer territory, and moreover the natives are of a higher order of civilization than their more westerly neighbours. They are a peaceful, industrious, and most friendly race, who cultivate large areas of country along the river-banks, until the stony region is reached, close to the point on the river where Colonel Marchand was compelled to abandon the *Faidherbe* after leaving Fashoda. The little cultivation found beyond that point is almost entirely confined to the islands in the river, as the banks are very stony and thickly wooded. In the cultivated districts the population is very dense, and the river-banks are dotted with numerous huts and hamlets built close to the edge of the bank and overlooking the river. These huts are usually erected on small mounds slightly raised above the normal level of the bank, are neatly built of mud and wattle, with grass roofs, and are scrupulously clean and well-kept. A

a rule, they are surrounded by a fencework of tall reeds and grass, giving absolute privacy to the occupants, similar in general principle to the "kisikatis" so common in Uganda. Within the enclosure so formed, in addition to several huts for the family, are the granaries and other smaller enclosures for the herding of goats and sheep at night. The whole interior is most carefully plastered over with mud, and quite free from dust and dirt. In addition to grain of various kinds, the natives also grow tobacco and cotton. The latter commodity they do not attempt to make use of in any way, and the whole of it is usually taken over by the Gallas inhabiting the summit of the Abyssinian plateau; but tobacco they smoke themselves. As a rule, the men are more decently clad than the Nuers, as many of them wear beautifully cured skins round the loins, and they are in every way far cleaner, better groomed and smarter looking than their westerly neighbours. Beads, obtained from the Gallas, are very generally worn round the neck and waist, and in addition splendid ivory bracelets are frequently to be seen on the arms of the men. These natives, however, do not appear to be either warlike or courageous like the Nuers, and, being great agriculturists, their main desire seems to be to cultivate their fields and remain at peace with their neighbours. Their spears are generally small-headed with long handles, and many of the men and boys are armed with merely sharp-pointed sticks hardened at the ends by fire. We saw a very curious species of spear amongst these



IN THE ABYSSINIAN HILLS.

(Photo by Major C. W. Gwynn.)

natives, the heads of which are manufactured from the leg-bone of a giraffe, polished down to about an inch or three-quarters of an inch in diameter, some 18 inches in length, and sharpened to a fine point. This is secured in the ordinary way to a long wooden handle, and the join covered by lizard-skin.

The elder married women all wear skins, cured or otherwise, round the loins, and these are often daintily picked out with a border of



MUER SHEIKH AND SON.

(Photo by Major C. W. Gwynn.)

varicoloured beads. The dress, if it may be so called, of the unmarried women and girls consists of an accumulation of beads round the neck, and a large number of strings of beads round the waist, from which a small fringe, as it were, of generally white opaque, or white and light-blue, beads depends some two or three inches in length over the hips, and in front and behind. As the girls are often very beautifully made, and possess pleasant, laughing, and sometimes really pretty faces, a group of them together forms a most charming picture.

On January 26 we reached the point in the river beyond which Marchand had found it impossible to navigate his launch, the *Faidherbe*, owing to the existence of rocks and rapids in the bed. He had in consequence drawn the launch up on to one of the wooded islands, and, after securing it by chains to neighbouring trees, and building a grass house over it to protect it from the weather, had abandoned the launch, together with several aluminium barges. The natives pointed out to us the island on which it was beached, and accompanied us across a ford to the site of the boat; but nothing would induce them to approach the grass hut, nor enter the presence of the boat, which they viewed with the greatest superstition, imagining apparently that the house was erected for the accommodation of evil spirits left to guard the steamer. Some two months later, and by the order of the Emperor Menelik, large numbers of Gallas and Abyssinians were sent down from the summit of the plateau, with instructions to take the steamer to pieces and convey it in sections to Adis Abeba. An Abyssinian specialist was sent down from the capital to superintend the transportation and the taking to pieces. The hull, some 50 to 60 feet in length, however, was merely cut in two, and carried with great difficulty to the foot of the steep ascent of over 3000 feet from the Baro gorge to the top of the plateau. Whether it ever reached the top I cannot say, as we left the country before the ascent was commenced; but, as nothing more than a precipitous goat-track to the summit existed at that time, and each of these large sections required about 100 men a-piece to transport it, I fancy a good many Gallas are likely to have met with violent deaths during the undertaking, unless a good road was constructed, or the sections were still further cut up. The Abyssinians, however, led us to understand that, cost what it might, the boat in its entirety was to be taken to the capital.

The nature of the country now underwent an entire change. The swampy soil we had become so familiar with gave place to stone and gravel. Low rocky hills approached the river-banks, which were densely wooded with trees and scrub, necessitating a considerable amount of cutting in places to enable the transport animals to travel with their loads. Several large sandy beds of streams were crossed; but, owing to the close nature of the country, it was impossible to conjecture whence they came. As they were all dry, however, I think it unlikely any of them have their origin in the highlands, with the exception of the Bonga, a small stream, at that time, of running water 15 to 20 yards wide, and 6 to 9 inches deep. A few miles beyond the Bonga we entered the gorge of the Baro, and as we proceeded further up, lofty hills enclosed the valley until eventually, after crossing the Baro a few miles above where it was joined by the Birbir river from the north, we were confronted by the steep ascent of over 3000 feet to the summit of the Bure plateau. This ascent was accomplished with

great difficulty in two stages. Fortunately, the Abyssinians came down with large numbers of Gallas to assist us in the undertaking, or we should never have been able to accomplish it. After a long trying day, during which we found our camels quite unequal to climbing the steep slopes, we reached a rocky nullah with pools of water, some 1400 feet above the river. The Gallas carried in our camel-loads; but, in spite of these ungainly animals being unloaded, they succeeded in leaving the narrow track, and took an ignominious dive down the side of a precipitous hill-slope until they were brought up sharp by the rocky nullah some 50 to 60 feet below. Eight donkeys, with their loads, had previously started the fashion, and what with camels and donkeys



CULTIVATED COUNTRY: LEGA GALLA.

(Photo by Major C. W. Gwynn.)

lying about in a confused mass below, we had a pretty lively time, and spent several distracting hours before we could get them up again and into camp, which was only a few hundred yards beyond. Marvellous though it seemed to us, none of the animals were killed, and all were eventually got into camp by dark, with the exception of one or two camels which were brought in next day. Men and animals were pretty well worn out, although we had only marched some 4 miles, so it was somewhat depressing to find that the final ascent of 1800 feet to the summit was quite impracticable for loaded animals. However, the Abyssinians came to our rescue by supplying us with large numbers of Gallas, who, during the next two or three days, carried up

all our belongings, enabling us to take the animals up empty ; but the camels were hopeless, and at the end of three days we had with the greatest difficulty only managed to get six out of the seven to the summit. The seventh never lived to breathe the exhilarating air of the plateau above, as he succumbed to his efforts long before he could be dragged to the top. A mule and several donkeys also found the climb too much for them, and, much to our regret, sought peace and rest from their troubles by lying down and refusing to live any longer.

It was really a most dreadful climb, and one not to be lightly entered upon when encumbered with a large number of transport animals. We were now at an elevation of about 5200 feet, and the fine air, vegetation, and beautiful butterflies reminded Major Bright and me very strongly of Save, on the northern slopes of Mount Elgon, in East Africa. The view from our lofty position across the Baro and Birbir valleys lying so far below us was grand in the extreme, and occasioned some very quaint remarks from our Sudanese, many of whom had never before been in or even seen hilly country. Major Bright's boy remarked to him, in broken English, that he didn't see how we were ever going to get out of the country again, as there were "hills at all four corners." The edge of the plateau hereabouts is uninhabited, and it was not until we had proceeded some 6 or 7 miles in an easterly direction through undulating wooded country that we reached the first Galla settlements. Here, unfortunately, I was taken seriously ill, and it appeared doubtful at one time if I should recover. Thanks, however, to Major Bright's assiduous attention to me, I was sufficiently well at the end of a fortnight to continue the journey from Bure to Gore, where the head-quarters of the Abyssinians of this region are situated.

Our road for the next 11 or 12 miles passed through a most fertile tract of country, intersected by numbers of small valleys and streams. In every direction small huts and hamlets are dotted about, as the Gallas hereabouts are very numerous. These have cleared extensive plots of ground for cultivating purposes, and quantities of grain are grown throughout the Bure district. In addition to cereals of all sorts, such as dura and Indian corn, peas and beans ; tomatoes, potatoes, and coffee are also grown by the Gallas. They are rich also in flocks of goats and sheep, and possess cattle, but in lesser numbers ; whilst eggs, butter, milk, and honey are generally easily obtainable. Mules and donkeys are bred extensively on the plateau, and horses and ponies are also seen in large numbers. Although we saw no cotton grown on the plateau, it is brought up from the Baro valley by the Gallas, who weave it into a thick coarse cloth, with which the better class of them and most of the Abyssinians are clothed. The coinage generally employed by the Gallas consists of bars of salt some 8 inches in length, 2 to 2½ inches broad, and perhaps an inch thick. These are bound at intervals

with grass to prevent their cracking. In the Bure and Gore districts ten bars of salt without a flaw were regarded as the equivalent in value of a Maria Theresa dollar.

The Bure district, as already mentioned, is cleared to a large extent, but after descending from a ridge some 18 or 19 miles from the edge of the plateau into a seeming hollow and entering the Abiu district, the country becomes very thickly wooded, and the inhabitants less numerous. The physical features of the country still remain much the same, but more confusing, as an amazing labyrinth of ridges and valleys is traversed. The country is so close that whence the numerous



GIDOMI MARKET.

(Photo by Major C. W. Gwynn.)

streams come or whither they go it is quite impossible to see. They all, however, eventually find their way into the Birbir river, and so into the Baro. Some miles before the foot of the Gore ridge is reached, the track passes through an uninhabited region. The whole of this portion of the country lies between 5000 and 6000 feet above sea-level, and, as may be readily imagined, is very hilly and difficult for transport animals accustomed to the plains.

Gore town is situated on the summit of a high grassy ridge, very much in the shape of an irregular horseshoe, at an altitude of about 6580 feet above sea-level. The ridge is crowded with the houses and huts of the Abyssinian officials and soldiery, as well as those of a large Galla population. In addition to a large council-chamber,

workshops, arsenal, store-rooms, etc., the Abyssinians have built a small church here, in the churchyard adjoining which the remains of the late M. Clochette, a French officer who died at Gore a few years ago, are interred. The climate of Gore is most bracing, and a magnificent view is obtained on a clear day of the whole surrounding country. The cold at nights, however, is very great, and we suffered most serious losses amongst our transport animals, who were quite unaccustomed to it, and died off at an alarming rate.

So much has been written and said of the Abyssinians, that I do not propose dealing with them, as I fear this paper is already running to greater length than I had intended. We remained altogether close on two months amongst this warlike race, of whom we saw a great deal during our residence. We were not sorry, however, to leave the country, for the loss of so much of our transport was occasioning us great anxiety, as we were not able to fully replace our losses by purchasing fresh ones from the natives. In spite of purchasing some thirty-eight donkeys and three mules from the Gallas, by the time we reached the edge of the plateau on our return journey we found our transport reduced in numbers by more than half, as we had only some sixty-eight donkeys capable of carrying loads, one camel, and six mules. We experienced considerable difficulty in removing our loads to the gorge of the Baro valley from the summit of the plateau, and for the next three weeks we had to proceed by double stages to Itang, as we were unable to carry all our gear with our diminished numbers. We purchased food from the Anuaks as we went along, and on our arrival at Itang on April 24 we decided to abandon everything not absolutely essential for the journey south, trusting later to be able to recover the stores left by steamer from Nasser, as the river is easily navigable, when full, up to that point. The headman of the village agreed to store our things until called for, and also provided us with two guides to conduct us south to the river Gelo, where we were to pick up fresh guides.

We spent a few days at Itang, to enable our transport to pick up strength for the journey, as the grazing they had enjoyed for several weeks past had been very scanty; and on April 29, after a complete reorganization of the expedition, we started south. The first day's march, however, we encountered a most formidable swamp some 12 miles from the start. This had been formed by numerous spills from the Aluro river, which had overtopped its banks owing to the recent heavy rains. Several of the spills were waist-deep, which necessitated the unloading of all the animals, and the loads being carried across by men. By 6 p.m. we managed to reach a piece of high ground, a mere mound in this area of swamp, on which it was possible to camp.

Floundering through another half-mile of swamp, next day we reached the Aluro, a rapid stream in heavy flood, some 20 yards in width. The whole morning was spent transporting all loads, etc., to

the south bank; but early in the afternoon we were visited by a heavy downpour of rain, which continued until after dark, so we remained camped in some 6 to 9 inches of liquid mud and water. We pushed on again next day; but only made one more mile in a southerly direction through the swamp to another mound occupied by a colony of fishermen. These came to our assistance, and helped us to carry our loads to this point, as many of the donkeys were quite incapable of travelling



A DINKA AT FASHODA, SHOWING CURIOUS METHOD OF DOING HAIR.

(Photo by Major C. W. Gwynn.)

loaded through the mud, and the camel carrying our Berthon boat was hopelessly at sea. The following day another mile took us through the swamp, and we continued our march to a swampy khor—the Bela by name—some 11 miles distant. On May 3 a long and exhausting march of 14 miles, which occupied the whole day from 6 a.m. to past 6.30 p.m., brought us to the Gelo river and the village of Patok. Progress on the march was dismally slow, as our animals frequently became involved in tracts of bog into which they sank almost up to

their knees, and gracefully collapsed. Each donkey had to be individually unloaded, forcibly hauled out of the bog, and carried to drier ground before it could be reloaded and started off again.

On reaching the Gelo I had hoped to be able to proceed in the direction of Lake Tata, and there cross it; but we found it was quite out of the question to travel with transport animals, as the Gelo, like the Aluro, had overtopped its banks, and converted such a large expanse of country into swamp, that the river was unapproachable. Heavy rains were daily falling also, and the outlook was gloomy in the extreme, as some 25 per cent. of our men were down with fever after our experiences in the Aluro swamp, and a large percentage of the donkeys were also suffering from the same cause, and in a short time ten died, and six or eight became incapable of carrying loads. It soon became patent to us all that, unless we made every endeavour to get out of this country without delay, we should become hopelessly involved in bog and swamp, through which we should never be able to get our transport animals. With much reluctance, therefore, we were compelled to abandon all idea of reaching Lake Rudolf, and decided to make for Nasser Post as speedily as possible.

On May 5 we started off again in a westerly direction, down the Gelo, and for the next few days travelled by an inland track some distance from the river, which was fringed with a broad belt of swamp, and passed several large villages of the Anuaks concealed in thick belts of wood and stockaded. On May 8 we were able to camp once more on the river-bank, at a point where it was some 80 to 100 yards in width. For the next three or four days we followed the river-bank until we were blocked by a large expanse of swamp, where a swampy stream reported to flow out of the Mokwai, known as the Nimeri, closely approaches the Gelo, and is then said to flow north-west again into the Mokwai—another loop. Swamp was everywhere before us, north, south, and west, so we retraced our footsteps some 3 miles up the Gelo, and effected a crossing to the south bank, where it was little more than 30 yards wide, though very deep and flowing like a torrent. A branch goes off from the Gelo close to the point of crossing, and, after flowing west for a bit, runs up north (by report), and re-enters the Gelo at the junction of that river with the Pibor close to the village of Bil—again a loop. This river, the Gelo, is undoubtedly the one that the late Captain Wellby, in his splendid exploratory expedition from Adis Abeba to Nasser, describes as having been met with and crossed at lat. N. $7^{\circ} 50'$, where it appeared to flow from the south-east, was "over 30 yards broad, 8 to 10 feet deep, flowing about 3 miles an hour, and infested with alligators." Being in flood and nearly bank-full when we crossed it, the river was 13 feet deep, and flowing 4 to 5 miles an hour. During our journey along the Gelo, therefore, we must have crossed Captain Wellby's route. From May 8 to 12, as already

mentioned, we followed the north bank of the Gelo closely, and during that period no river from the south flowed into the Gelo. I was constantly on the look out for it, and inquired from my guides if they were sure one did not do so, as I was anxious to identify Captain Wellby's Ruzi. They told me of the existence of another river, the Akobo, further south, which I am inclined to think must be the same Akobo followed by Böttger as far north as Tedo, and is probably identical with Wellby's Ruzi.

After we had crossed the Gelo, therefore, we struck across an open plain in a south-westerly direction for some 15 miles, until we reached



OLD EGYPTIAN LINES AND NEW FRENCH FORT AT YASHODA.

(Photo by Major C. W. Gayman.)

the Akobo at lat. N. $7^{\circ} 46' 32''$. This river was fortunately not in flood: it was only some 20 yards broad and 3 to 4 feet deep, and flowing very sluggishly through a canal-like cutting, so we had no difficulty in crossing it. For the next two days we followed the river by a most extraordinary winding course, and yet flowing due west, until we reached its junction with the Pibor at lat. N. $7^{\circ} 47' 41''$. It would appear, therefore, that the Akobo or Ruzi and the Gelo rivers never meet, but flow by independent courses into the Pibor. The Pibor, at the point we struck it, was some 70 or 80 yards wide and 11 feet deep, with practically no current, as it was not yet in flood. We crossed to the west bank by means of the Berthon boat, and the

following day were confronted with the Khor Geni, which I have already referred to as being probably the same as that entering the Sobat river some miles below Nasser Post. As it was 30 yards broad and 10 feet deep where it flowed out of the Pibor, we had to again use the Berthon boat to reach a deserted village on the opposite bank. For the next day or two we continued along the Pibor, passing several deserted villages which are merely used as fishing villages during the dry seasons of the year by the Nuers, until we reached a thickly populated district where Sheikh Yowe and some 7000 Nuers are settled in a group of villages known as Wunadeng, Uentau, and Koratong. Here we obtained food and fresh guides to conduct us to Nasser Post, and on May 22 camped opposite the junction of the Gelo with the Pibor at lat. N. $8^{\circ} 8' 45''$. Three rivers meet at this point, the third probably being the branch from the Gelo which flowed out of that river close to where we crossed it prior to marching south to the Akobo. The natives told me it was deep, and canoes were required at Bil village to cross it. I was, unfortunately, unable to fix accurately the junction of the Mokwai with the Pibor further north, as we were compelled to leave the bank of the Pibor some distance above, owing to a large expanse of swamp extending from just north of Kur village to the Sobat-Pibor junction. About this time we were treated to very heavy rain, which converted the whole country into bog, and travelling with donkeys was a most laboured undertaking. We struck the Sobat again some 3 or 4 miles below its junction with the Pibor on May 26, and the following day pushed straight through to Nasser Post by the track we had previously traversed early in January. During the five months since we had left the Dom palm camp on December 28, our losses in transport animals had been very heavy, as 108 donkeys had died, and all the camels, and nine out of the ten original mules had also succumbed. The stores abandoned at Itang were subsequently recovered by steamer towards the end of June, and Omdurman reached on July 7. A few days spent here were sufficient to enable us to complete all handing over of stores, etc., to Colonel Talbot, R.E., before leaving for Cairo and England.

NOTES OF A JOURNEY ON THE TANA RIVER, JULY TO SEPTEMBER, 1899.

By Captain H. de PREÉ, R.H.A.

A FEW notes about a shooting expedition made on the Tana river, East African Protectorate, by Lieut. Hankey, Royal Horse Artillery, and myself, may be of some little interest now that attention has been drawn to that part of the world by the rising of the Ogaden Somalis.



SOMALI HUT AND CATTLE ENCLOSURE, KISMAYU.

After landing at Mombasa from Bombay, and making various preparations, we took the East African Protectorate steamer *Juba* to Kismayu, whence we hoped to make our way through southern Somali-land, a hitherto almost untravelled country, past the chief place Affmadu, to the Gwaso Nyero river, and so round the north of Mount Kenya to the rail-head of the Uganda railway, which was at that time just past the Athi plains. Through the kindness of Mr. McClellan, of the East African Protectorate service, we purchased about forty camels in Italian Somali-land, and were just ready to start when an order came from the British Foreign Office forbidding our journey. We consequently had to dispose of our camels and trade goods, and a large part of our leave was wasted, but we determined to go about 170 miles down the coast to Lamu, and to make that a starting-point for the Tana river.

The Tana river is about the southern limit of the Somalis, who, although they do not live on it, raid the Gallas and Pokomos who inhabit its banks. As a result of the fear they instill, the villages are generally built on the right bank and in the dense forest that lines the river. In the lower reaches the river runs through wide flat alluvial country, where tropical forest alternates with open plains (which are evidently dried swamps) and slight cultivation. Higher up the forest belt is continuous, and has a greatest breadth of, say, 2 miles. Outside this stretches the dry sandy bara as far as the eye can reach. It consists of wait-a-bit and various kinds of mimosa scrub, mostly about 10 feet high, with an occasional *Euphorbia candelabra* and umbrella tree. Here and there this bara comes right down to the river, and these

places are called by the Gallas "Malkas." This means "drinking-places," from the fact that they usually travel just outside the forest belt, and these are the only spots at which they can get down to the river to drink. Nearly all communication between the villages is by canoe, though the Gallas travel a good deal on foot. The Pokomos, in spite of being an extremely muscular and well-developed race, are the most abject cowards, and are greatly afraid of the Gallas; while both races seem to fear and to suffer much at the hands of their neighbours. As an instance of the dread they have of leaving the shelter of the dense forest by the river, I may say that on three occasions we found the tusks of elephants, who had died, lying no very great distance from it, and two of these pairs must have been where we found them for years.

At the time of our visit, the Wakamba from the south of Mount Kenya had invaded the upper Tana, and this, coupled with an epidemic of small-pox, had caused practically the whole of the proper inhabitants to flee the

country. The people are now too educated to care much for the majority of trade goods. Any very small object may still be got for beads of the kind that happens to be in fashion, but the only articles that are welcome everywhere are white American cloth and big common sheath knives. A Somali knife is considered a great prize. Rupees are current as far as the mission stations, and they are always asked for as part of the payment for ivory, because the Gallas like getting them to take down to the coast to purchase cattle with.

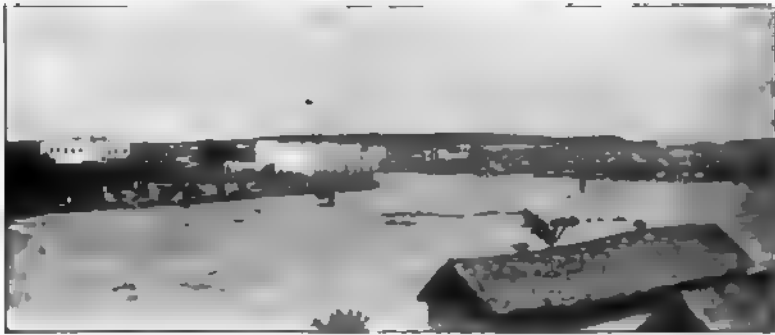
As our transport consisted partly of canoes and partly of porters, it was necessary to arrange each day so that both parties should meet—no easy matter without a local guide (the Gallas are infinitely the best guides), on account of the tremendous windings of the river and the denseness of the forest. The windings are such that in a combined land and river party moving up stream, starting at 6 a.m., the land party will get into camp at 10 or 11 a.m., while the canoes will not reach it till 4 or 5 p.m. Canoes hold from fifteen to forty loads. They



MSANIA TRACKER

are usually worked by two men with punt poles or paddles. The Pokomos are the best punters I have seen in any country.

Near the Malkas are the chief drinking-places of the game, which mostly live in the bara. The natives harry the game a great deal, the Wasānia or Wāta or Wabōni, the hunting tribe of the country, being always after them, snaring them and sitting up over water for them, and nearly every village has its game-pits. The elephants are the chief victims, as the natives, besides Arabs and Swahilis from the coast, spare neither age nor sex, and if the Government, instead of troubling as much as they do about the shooting of European sportsmen, would turn their attention to this butchering of oows and young ones, their efforts at preserving game might be more effective. A few Gallas kill elephants in a very daring manner, though, and deserve everything they get. They track them from water till they stop to rest, either standing sleeping at night or drowsing under a tree in the heat of the day. They then smear themselves with elephant-dung, and, creeping up, plunge a spear with a head like a trowel into the elephant's belly, slipping away at once in the confusion. The elephant rushes off, the handle of the spear catching in all the bushes, and his intestines are soon so cut about that he lies down and dies. The large majority of natives, though, have a most wholesome dread of any dangerous beast. The elephants on this river seem to carry as heavy tusks as any in the world. Out of the tusks of four elephants we shot, the shortest was 7 feet 2 inches, while the longest was 9 feet 5½ inches, and the weight varied from 80 lbs. to 120 lbs. apiece.



KISMAYU, WITH ARAB FORTS.

The buffaloes, which were at one time in vast numbers, but were swept away by the rinderpest a few years ago, are increasing very fast. For any one not subject to fever, the shooting is good; we obtained about twenty different kinds of game during the trip; but the bush is very thick, and any game that is got has to be worked for.

The lower Tana is made absolutely unbearable by the mosquitoes,



VIEW ON THE UPPER TANA.

but above Golbanti (the chief English mission station) they begin to grow fewer, and gradually almost disappear.

The official map of the country is most misleading, as a large number of the villages marked have either shifted or disappeared. The Malkas seem to be the most permanent landmarks in the country. The Galla mountains and Mount Friedrich Franz shown on the official map are, I fancy, a myth of Dr. Peters, as from the mouth to the great bend of the Tana where it turns west there is certainly nothing worthy of the name of a mountain, and nothing can be seen on either bank but a sea of scrub, even on going a long day's march from the river. The same can be said as far as a few miles short of the Hagareo falls (the limit of navigation), which is as far as we reached.

Captain Rogers, of the East African Protectorate Service, Sub-Commissioner of Lamu, showed us the very greatest hospitality. He was the means of our getting canoes and canoe-men on the Tana, and without his kind aid we should have found it almost impossible to start at all. Perhaps it would be unsafe to travel without an escort of some sort, but we never had the least trouble with any of the natives, and we finished the expedition without a mishap of any kind.

MADABA MAP.

By C. RAYMOND BEAZLEY.

THE sixth-century mosaic map of Madaba, the earliest piece of Christian cartography and one of the oldest geographical plans in the world outside the Egyptian and Assyrian monuments, deserves more attention than has yet been paid it in England. Three continental studies have lately appeared—(1) Germer-Durand's pamphlet of 1897 (*La carte mosaïque de Madaba, découverte importante*); (2) Konrad Miller's summary of Germer-Durand, in an *Anhang* to the *Rekonstruierte Karten* of 1898; and (3) Adolf Schulten's more detailed work of 1900

(*Die Mosaik-karte von Madaba u. ihr Verhältniss zu den ältesten Karten u. Beschreibungen des heiligen Landes*). Of these the first is not only the *editio princeps*, but contains (with the *Révue Biblique* of April, 1897) the best photographic reproductions of the map which have yet been published; the second is, for the most part, but a shortening of the first, with a Latinized and clarified copy of the map; the third is a work of great, almost of excessive, elaboration, consisting of an introduction and three special inquiries—on the relationship of the Madaba map to the *Onomasticon* of Eusebius, on its analogies to later maps and itineraries, and on its points of contact with ‘profane geography,’ especially as represented by the lost Julian and Augustan world-maps. It may be well briefly to recall the main facts as to the re-discovery of the mosaic. In 1880 the Christians of Kerak moved to a new home at Madaba, near the ancient Heshbon, and in clearing a floor for their new church laid bare (in the autumn of 1896) the remains of a scheme of Palestine and some adjacent lands. To Father Kleophas, librarian of the Greek Patriarch at Jerusalem, the discovery and preservation of this map are chiefly due; and some of the happiest suggestions for its further reconstruction have also come from him. From the fragments discovered it was clear that the original once occupied a space of about 15 by 6½ metres (say almost 49 by 20 feet); its length lies from north to south, but the east is at the top, as in most primitive and mediæval Christian designs. All the north part is now destroyed, except two fragments; and what remains, in all about half of the complete scheme, is mainly concerned with the country between Nablûs and the Nile. The orientation has been greatly disturbed by the assumption of the Levant coast, from Alexandria to Acre, as a base, supposed to furnish a line running practically north and south. In its general purpose this is a decorative, freely conceived, and by no means scientific, illustration of Bible history. Names and objects are not kept in any strict proportion; the perspective is conventional; but the rich store of inscriptions furnishes not a few details of novel interest. Mountains are indicated in coloured lines, which give fairly well the effect desired. The Dead sea is marked by blue wavy lines; two boats, of preposterous size, float upon its waters. In the larger towns, such as Jerusalem, Pelusium, and Gaza, an attempt is made to represent the principal streets (marked by colonnades), and even certain of the chief buildings, sometimes in round, sometimes in angular, forms. Cities of the second class are indicated by sketches of walls flanked by round towers. Each of the tribes of Israel seems to have originally appeared (Κλήρος Δὰν, κλήρος Συμέων, κ.τ.λ.) in great red letters, accompanied in some cases by a text of Old Testament prophecy. In many instances, and apparently wherever there is abundant space, the place-names are doubled, the ancient form being given along with that in use at the time of composition (c. A.D. 550); here and there historical or geographical remarks are added.

Out of the twelve tribes of Israel, only six can still be found—Dan, Symeon, Juda, Ephraim, Benjamin, and Zabulon—and several of these survive in a very fragmentary state. In connection with *Dan*, the apostrophe of Deborah from Judges v. 17 is quoted (ἵνα τί παροικεῖ πλοίοις;) as to *Benjamin*, the blessing of Moses from Deut. xxxiii. 12 is given (σκιαζει ὁ Θεός ἐπ' αὐτῷ, καὶ ἀνὰ μέσον τῶν ὀρίων αὐτοῦ κατέπαυσεν), probably in allusion to the holy city, lying as it did within the territory, but on the frontier, of Benjamin. *Ephraim* is associated with the blessing of Jacob upon Joseph, from Gen. xlix. 25, and with that of Moses upon the tribe of Ephraim, from Deut. xxxiii. 13 (Ἰωσήφ . . . εὐλόγησέν σε ὁ Θεός εὐλογίαν γῆς ἐχούσης πάντα καὶ πάλιν ἀπὸ εὐλογίας Κυ[ρίου] ἡ γῆ αὐτοῦ). As for *Zabulon*, there now only remain five letters from a clause of the prophecy of Jacob in Gen. xlix. 13; but the whole sentence was fortunately copied before this piece of the mosaic perished: Ζαβουλὼν παράλιος κατοικήσει, καὶ παρατενεῖ ἕως Σιδῶνος. The remaining details of the map may be dealt with under the tribes above mentioned, under the trans-Jordan region, and under Lower Egypt and Sinaitic Arabia.

In the territory of *Dan*, Modeim or Moditha, 'whence came the Maccabees;' Anob or Betoannaba, the Nob of Saul, according to St. Jerome; Lod, Lydda, or Diospolis; Geth or Gath, 'one of the five satrapies of former days;' Ashdod in the upland, and Azotus on the sea, are the leading places indicated. In *Benjamin*, the plan of Jerusalem naturally occupies the chief place. Here the most prominent feature is the great street flanked by colonnades which runs across the city from the north gate to the south; before the north gate there seems to be a paved square, and on it a column, recalling the modern title of 'Gate of the Pillar.' A second colonnade-street runs from this north gate to the south-east, crosses a lesser artery which enters from the eastern gate, and then proceeds due south, just within the east wall and parallel to the main street. These two roads are marked all along by the covered galleries or colonnades already noticed, and probably correspond to the δύο δημόσια, the two markets or bazaars, mentioned in an Arab account of the Persian storm of 614. Three gates are indicated, to north, east, and west; the first two being apparently of much greater size and importance than the third, which has rather the appearance of a postern. The Church of the Holy Sepulchre, with its round end towards the west, and communicating with the street on the east by a staircase, represents the work of Constantine and Helena, the first of the successive Christian sanctuaries on the site of the Passion. To the south, at the end of the great centre colonnade, appears what is probably the Church of Holy Sion or the *Cœnaculum*; at the north-east extremity of the city is another church, perhaps that of the Nativity of the Virgin (now 'St. Anne'); while beyond the walls, to the east, is the Church of Gethsemane and the Virgin's Tomb. The whole sketch of Jerusalem refers to the

time before the Persian destruction of 614, but subsequent to Constantine; more narrowly, it seems to preserve an excellent summary of the city's main features in the time of Justinian. The territory of Benjamin appears undamaged upon this map, and the localities of Jericho, surrounded by palm-trees, in the midst of which appears the 'sanctuary of Elisha;' of Ephrata, 'where the Lord journeyed;' of Ælamon, 'where the moon stood still at the bidding of the son of Navé;' of Bethabara, with the convent of St. John Baptist; of Rama and Gabaon; and of two road-stations respectively called 'the fourth' and 'the ninth' (τὸ τέταρτον . . . τὸ ἕννα[τον]), appear together with a few less important spots. Here, as elsewhere, the likenesses with St. Jerome's topographical indications are very marked, those with Eusebius, Jerome's master in Palestine geography, being somewhat less close than in other places. In *Ephraim*, part of the space (*e.g.* around Nablûs) has perished; on what remains we have Ænon, 'near to Salem;' Silo, 'where stood the ark;' the tomb of Joseph; the well of Jacob; Garizim; and Sichem, 'otherwise Sikima and Salem' (an exact repetition of a peculiar notice in Eusebius' *Onomasticon*). Like the latter, again, the map places the mountains of blessing and cursing near Jericho, though it has already marked them in the right position near Nablûs. The Aramaic term of tûr, or mountain (Τουρ), is annexed to both Γαριζίμ and Γωβήλ, Gerizim and Ebal. The towns of Theraspis and Betomelgesis, apparently assigned to Ephraim by the present design, are unique; no trace of them has elsewhere been found. In *Zabulon* nothing remains beyond what has been already noticed; but in *Symeon* we have Gerara, 'once a royal city of the Philistines and southern limit of the Canaanites.' Ἐνθα τὸ Γεραριτικὸν σάλτον, *here is the wood [?] of Gerara*, adds the map, which also gives, in the territory of this tribe, Arad, 'whence came the Aradians,' and Asemona, 'a town of the desert on the frontier of Egypt.' Arad is the Adar of the Vulgate, and Jethor, or Jethera, to the west of it, is the Jether of the *Onomasticon*, which notes it as wholly inhabited by Christians. In the west of the land of Simeon, the mosaic records several peculiar names (Edrain, Sobila, Seana, and Bethagidea; cf. the Edrai-Bethaglaim of Eusebius). In *Juda* much of the original detail has been lost, but to the south of Jerusalem is Akeldama, which is placed considerably to the north of the common or traditional site, supported by St. Jerome; the unusual position is no doubt due to Eusebius, whose language here agrees with the map. Bethlehem Ephrata, Rama, Bethsura (of the Maccabees), the church of St. Philip near the fountain where he baptized the Ethiopian, the terebinth-oak of Mamre near Hebron, Ascalon, Gaza, and Beersheba or Berossaba, are the chief Judean names; and 'so far,' says the map of the last mentioned, 'came southward the limits of Judea, even from Dan, near Paneas, which is the border in the north.' Gaza and Ascalon, though fragmentary, are evidently planned

as large towns, and a good deal of these city pictures still remain. Beyond the Jordan appear Ænon, 'now Sapsaphas' (perhaps [?] named after an early sixth-century monk and saint of this name, and in any case the 'Sapsas' of the seventh-century Johannes Moschos); the Baths of Kallirrhoe, marked as three in number; Kerak of Moab [Κρ]άχμωβα, on a height, as in nature; Betomarsea, 'otherwise Maiumas,' found only in this mosaic; Aîá, perhaps 'the Aîê of the *Onomasticon*,' the ancient Rabbath Moab, the Greek Areopolis; and Balak, 'or Zoora,' to the south of the Dead sea (Lot's Zoar). The principal inscription of this part refers to the same Dead sea, also called the Salt or Asphaltic lake, whose enormous size and detailed execution suggest that it was well known to the designer. Finally, in Lower Egypt and the desert of Sinai are a number of places and legends. Among these are 'the Desert where the brazen serpent healed the Israelites;' 'the Desert of Sin, where the manna was sent down and the quail [*sic*];' and Raphidim, 'where Israel fought Amalek.'

According to a tradition at Madaba itself, the map, when first uncovered, had a picture of the holy family flying into Egypt, not along the coast as in later stories, but well inland across the desert. Rhinocorura and several towns lie on the edge of a curiously exaggerated stream marked as the frontier of Egypt and Palestine; in the Delta, Pelusium, though in fragments, appears as a city of great size and splendour, second only to Jerusalem; Tanis, Sais, Xoïs, Athribis, Hermoupolis, and five other Egyptian towns are also figured; while three arms of the Nile are enumerated—the Pelusiatic to the north [east], an unnamed and partially destroyed channel to the south [west], and the Sebennitic in the middle, with three ramifications—Saitic, Bucolic, and Bolbitic. These names are all inscribed along the course of the stream.

We cannot here do more than refer students to the detailed comparison between the Madaba mosaic and the *Onomasticon* made by Schulten, a comparison which is capable of considerable refinement, and is well followed out both in the general topography and orientation and in the minor details. It is only in certain points, however, that practical certainty can be attained of any direct use by the map-designer of Eusebian material. The relations between this plan and the text of St. Jerome, the so-called Jerome maps, and the chief pilgrim itineraries of the earlier Middle Age, from the Bordeaux of 333 to the Willibald of the eighth century and the John of Würzburg of the twelfth, are carefully examined; each of the mosaic's 140 names and legends is separately passed in review and compared with everything fairly analogous in later classical and earlier mediæval geography; and one result of this is to warn us against too ready an assumption of intimate connection on the ground of verbal coincidences, which may often be accidental.

THE SCULPTURE OF DESERT REGIONS.*

THE work of Prof. Johannes Walther during the last fifteen years has placed him amongst the first authorities on the desert lands of the globe, for he has not only brought an almost unrivalled critical knowledge of travel literature to bear on the subject, but has himself made three considerable journeys in desert regions in various parts of the world. The publication of a summarized statement of the matured results of his studies to the present time is, therefore, a real service to students of geography and geology, all the more when, as in the book before us, that statement takes the form of a luminous exposition of the whole subject, illustrated by photographs and drawings of a standard of excellence rarely reached in works of the kind. We would specially commend these illustrations to teachers as type specimens difficult to obtain elsewhere.

The fundamental proposition laid down by Prof. Walther is that a desert region is essentially a region without external drainage, and that therefore all its material, soluble and insoluble, can only be transported about within itself, excepting only trifling quantities of dust and sand carried by wind over the water-parting which bounds it. Such a region is necessarily complete in itself, and in an exhaustive investigation all material eroded and transported from one part must be accounted for in another. Next, while drawing some interesting comparisons between the surface of a desert and the floor of the ocean, Prof. Walther refuses to consider that desert regions are in general ancient sea-beds, and he further rejects all theories which try to account for the present relief of such regions by periods of different climate in the past. The desert region is to be regarded as one over which the conditions have remained as we now find them for periods at least commensurable with the persistence of present conditions in equatorial and temperate regions, and it follows as an immediate consequence that the modelling of its surface must be accounted for by the action of forces still at work.

In dealing with the effects of erosive action in deserts, Prof. Walther rightly insists on the futility of attempting comparison with more familiar regions of abundant moisture. The desert is, as he says, the land of geographical paradox, rain-clouds which distribute no moisture, springs without streams, rivers with no mouths, lakes with no outlet, dry valleys, dry deltas, waterless regions below sea-level, intense watering without weathered rock-surfaces, and decay of rocks from within outwards; obviously a land where the most skilled interpreter

* 'Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit.' Von Johannes Walther, ao. Professor der Geologie und Paläontologie. Berlin: Dietrich Reimer (Ernst Vohsen). 1900.

of the topography of moister regions must go warily. The chief points here brought out may be summarized as follows. The weathering action taking place at all surfaces is intense, and is mainly of two kinds—chemical action in the soluble constituents of rock, brought to the surface in solution through the rock pores and there deposited by evaporation, and mechanical action due to rapid large changes of temperature. In the chapter devoted to “dry weathering,” we find many new points of interest in connection with the hard dark-coloured skin frequently observed in desert rocks, due to the oxides of iron and manganese; also valuable observations of diurnal changes of temperature of the rock surfaces. Then comes the most important generalization of all, the definition of the true action of wind as a transporting agent which removes the weathered rock material, whether soluble or insoluble, as soon as it appears at the surface, thus constantly exposing fresh rock to the erosive forces, and deposits it again at a distance. To this action Prof. Walther gives the distinctive name of Deflation; he regards it as *the* determining factor in desert sculpture, and relegates the abrading action of blown sand to a quite secondary place.

The primary agent in the reduction of a desert surface being thus clearly defined, special attention is given to modifications of its action produced by other agents, and especially by the cloud-bursts met with in all deserts. Prof. Walther gives descriptions, drawn from various sources, of the appearance of rain-clouds over a level surface of desert, where great condensation is obviously taking place in the upper strata of the atmosphere, although no rain reaches the ground; and he shows that sudden precipitation of enormous quantities of water must take place when such a cloud strikes an elevated mass of land. The water, carrying with it all the disintegrated material too large to be removed by wind, rushes down the mountain-side, tearing open any cleft through which it can find its way, and scattering detritus over the plain, and is quickly evaporated, throwing out large deposits from solution. The opened cleft is now exposed to the “dry weathering” and deflation action in intensified form; perpendicular walls, suddenly passing from full sunshine to deep shadow, undergo great changes of temperature, and the wind rushes up and down the narrow corrie. Hence the opening is gradually widened, the deflation action being assisted by occasional cloud-bursts, and a *wady* is formed. Evidently the result must be very different from the work of rivers; there is here no system of main and tributary valleys, but a labyrinth of deep-cut channels which end blindly or open into wide amphitheatres in the higher ground.

Space does not permit us to do more than refer to Prof. Walther's discussion of the ultimate deposition of the material removed by deflation from the desert. Desert regions are usually bounded by steppes, where moisture and vegetation afford a more or less fixed

surface beyond the direct action of the wind; hence the soil of the steppe is in the first instance derived from the desert, and we arrive at the loess theory of von Richthofen. We can merely mention such matters as the occurrence of oases, temporary lakes, and the like, which are fully dealt with, and the special chapters on the flora and fauna of deserts, on salt deposits, and on fossiliferous regions. The book not only gives, in compact and satisfactory form, much that is new to the general student, but much that may be very suggestive in the study of regions in which æolian action may be of greater importance than we now suppose.

LAUNCH OF THE ANTARCTIC SHIP "DISCOVERY."

THE special exploring vessel built for the National Antarctic Expedition was launched from the yard of the Dundee Shipbuilders' Company at Dundee on Thursday, March 21. The shipping in the docks was gay with bunting in honour of the occasion, the whalers *Balaena* (which visited the Antarctic in 1892-93), and *America* (formerly the *Eskimo*, and re-named since her purchase for the Ziegler Arctic expedition) being especially prominent. Before the launch an opportunity was afforded of inspecting the *Discovery* and observing her surprisingly graceful form externally, and the solidity and convenience of all her internal arrangements. No exploring vessel was ever more carefully planned or more conscientiously constructed.

At 3.30 p.m. the dockyard and the neighbouring esplanade were crowded with people, a specially invited party occupying the platform in front of the bow of the vessel. Mr. Low, the chairman of the Dundee Shipbuilders' Company, presented Lady Markham with a pair of gold scissors, with which she cut the white ribbon holding back a bottle of Australian wine wreathed in flowers, and allowed it to swing against the steel sheathing of the stem. As the bottle broke, Lady Markham named the ship the *Discovery*, and a few moments later the vessel commenced to glide along the greased ways, and, gradually increasing in speed, shot out into the Tay with a magnificent splash. Two tugs were in waiting, and proceeded to tow the *Discovery* into the dock, where she was berthed beside the 90-ton crane where her boilers were lying ready to be put on board. The appearance of the vessel in the water was singularly graceful when the extraordinary strength of her construction was taken into consideration.

Immediately after the launch a luncheon was given in the Queen's Hotel to a very large company, including most, if not all, of the arctic whaling captains at present in Dundee. The following ladies and gentlemen, amongst many others, supported the chairman (Mr. Low): Sir Clements and Lady Markham, Commander R. F. Scott, Lieut. and Mrs. Armitage, Lieut. Royds, Mrs. Royds, Dr. and Mrs. Koettlitz, the Lord Provost of Dundee, Sir Reginald Ogilvy, Prof. D'Arcy Thompson, Mr. Warrington Smyth, Captain Wilson-Barker, Mr. George Murray (of the British Museum), Dr. J. Scott Keltie, Colonel Bailey, Dr. H. R. Mill, Mr. and Mrs. W. S. Bruce, and Mr. Cyril Longhurst.

The toast-list was a formidable one, involving no less than twenty-two speeches including replies. After the loyal and patriotic toasts, the Chairman proposed "Success to the *Discovery*, and the health of Lady Markham," to which Sir Clements Markham replied, observing that the *Discovery* was the sixth exploring ship of her name; the first explored Hudson strait in the seventeenth century, the second

explored Hudson bay, the third was the consort of Captain Cook's ship on his last voyage, the fourth was Vancouver's when he explored the Pacific coast of North America and circumnavigated Vancouver island, and the fifth took part with the *Alert* in the arctic expedition of 1875.

The Chairman next proposed the "Antarctic Ship Committee and Mr. W. E. Smith, Chief Constructor, R.N.," in replying to which, Sir Clements Markham, after expressing his regret at the unavoidable absence of Mr. Smith, said that the specifications prepared by the committee, though very long, could be summed up in Longfellow's lines—

"Build us straight, O worthy masters,
Stanch and strong, a goodly vessel
That will laugh at all disasters,
And with ice and whirlwind wrestle."

The company had turned out by far the strongest and most efficient scientific exploring vessel that ever left these or any other shores, and he proposed "Success to the Builders."

Dr. G. W. Baxter proposed "The Commanding Officers and Civilian Staff of the Expedition," to which Captain Scott replied, expressing his pride in the ship, and the determination of all connected with the ship to do the best they could, which was all that any man could promise.

Dr. H. R. Mill proposed "Success to the German, Swedish, and Scottish Antarctic Expeditions," all of which were being prepared, not to compete with one another for the first place, but to advance scientific knowledge by mutual co-operation. All were determined to do their best, and in the words of Robert Burns—

"Wha does the utmost that he can
Will whyles do mair."

Mr. W. S. Bruce, the leader of the proposed Scottish Expedition, replied, expressing his conviction of the need for many expeditions before the work of exploring the Antarctic Regions would be complete, and saying that the Scottish expedition was, after all, only a branch of the British, sailing under the same flag and fighting for the same cause—the advancement of science.

The other toasts were of a local or personal character.

THE MONTHLY RECORD.

EUROPE.

The Capture of the Meuse by the Meurthe.—The beheading of the Meuse by the Meurthe, and the consequent diversion of its upper waters to the Moselle, has long been regarded as one of the classical examples of river-capture. The historical evidence to which this interpretation was given by Woblgemuth and Davis was mainly (a) the existence of a depression between Toul and Pagny-sur-Meuse; and (b) the presence of pebbles of granite and diorite, which must have come from the Vosges, in the older alluvial deposits of the Meuse, below Pagny. In a paper on the valley of the Ingressin, published in the January number of the *Annales de Géographie*, Prof. G. Bleicher, of Nancy, gives an account of a minute examination of this region, undertaken partly at the instance of the Société Belge de Géologie, Paléontologie et Hydrologie, which visited it in 1898, and as a result of his researches finds that the hypothesis of capture is open to grave objection.

The Ingressin comes from the Val de l'Ane and enters the Moselle at Toul, and Prof. Bleicher finds that it has never crossed the Val de l'Ane. The river-terraces of the Moselle do not reach the sill dividing the Ingressin from the Meuse; in fact, they cease 6 kilometres from Toul. The granite and diorite pebbles, which have certainly come from the Vosges, occur on the Meuse above Pagny as well as below it: they can be traced as far down as Mouzon, in the beds of watercourses which crossed a continuous slope from the Vosges to Lorraine in Pliocene times, and they are found more than 100 metres above the present valley-level. A boring, which is shortly to be made on the sill of the Val de l'Ane, should give a final answer to this question.

ASIA.

The Course of the Dihong.—An attempt is once more being made this year to effect a survey of the still unknown portion of the Sanpo-Brahmaputra—that in which the great river makes its way through the Eastern Himalaya to the plains of Upper Assam. Although all doubt as to the identity of the Tibetan Sanpo with the Brahmaputra was set at rest by the combined results of the journeys of the pandit A—K in 1882, and of Mr. Needham in 1885–86, a special interest still attached to this unexplored section, owing to the supposed mountainous nature of the country through which the Dihong here flows, and the fact that an enormous difference of level—placed at over 10,000 feet—existed between the lowest known point on the Sanpo and the emergence of the Dihong from the hills. The distance being only about 130 miles, it has been supposed that during this interval the course of the river must be marked by a succession of falls and rapids, while rumours of stupendous and impassable gorges have long been current. The new attempt to complete the survey of this section has been inaugurated by the Survey of India Department, by which two Gurkha surveyors have been specially trained for the work, the local arrangements for their journey being placed in the hands of Mr. J. T. Needham, political officer at Sadiya, whose active interest in the solution of the problem has long been well known. Details of the progress of the enterprise down to March last appear in the *Calcutta Englishman* for February 27 and March 29, 1901. The route selected by Mr. Needham is that on the right bank of the Dihong, for, though another is reported on the left bank, the right bank route appears to be the easier. The great difficulty in the way of exploration in this country has always been the opposition of the Passi-Minyong people, who fear the loss of their present lucrative position as middlemen between the British marts and the more distant tribesmen. The largest of their villages trading with British territory is that of Kebang, on the right bank of the Dihong, near its exit from the hills, and Mr. Needham hoped to secure the success of the enterprise by arranging with the headmen of the village for the reception of the surveyors, and their assistance on their further route. As regards the latter, it is surprising to learn that “the route to Gyala Sindong from Sadiya through Kebang is as easy as it is possible to conceive it, for to the north of Kebang there are no mountains to negotiate, the country being open and undulating, and the distance is absurdly small, being ten stages only.” Beyond the Passi-Minyong country the people are Pangis, a cognate tribe, speaking the same language, and equally civilized. One and all are keen traders. The Tibetan frontier town, known to us as Gyala Sindong, is called by them Janbo, and the Tibetan country thereabout, Membo. A slave from Pang-kang, one of the villages on the route (all of which are on, or within sight of, the Dihong), who made his way a few years ago to Sadiya, told Mr. Needham that he had seen at Pang-kang a native in the British service, named Gumdan, who is identified with a surveyor named Guman Sing, sent some years ago to Gyala Sindong. The two Gurkha surveyors sent out from

Sadiya on February 13, proceeded by boat to Passi-ghat on the Dihong, and thence half a day's journey to the village of Gina. Here permission to advance was persistently refused, and the surveyors were forced to return to Sadiya. Mr. Needham sent the Miri interpreters, who had accompanied them, to demand an explanation, and these, after five days' negotiations, at last persuaded the people that their fears were groundless, and obtained promises of help. A second start was made on March 18, but with what result has not transpired.

The Maldives and Minikoi Island.—Mr. J. S. Gardiner, Fellow of Gonville and Caius College, Cambridge, who has lately visited the Maldives and Minikoi for purposes of research, has given a preliminary account of his work in two papers printed in the *Proceedings of the Cambridge Philosophical Society* (vol. xi. part i.). The first treats of the natives of the Maldives, and after briefly sketching the history of the islands and the dealings of Europeans with it (under which, however, no mention is made of Pyrard's sojourn in the group), the author states his conclusions as to the origin and affinities of the people, further details being reserved for the full report to be published in conjunction with Mr. C. F. Cooper. Mr. Gardiner found no evidence to which weight can be attached of the former presence of Buddhism, and though a study of the charms still found among the people might be thought to point to Brahmin influence, it is more probable, the writer thinks, that the lower features of Brahminism arose among people who gave rise to the Maldivans as well. The latter will not allow that any affinity exists between themselves and any other people, but Mr. Gardiner points to the close likeness between them and the Singhalese as indicating that the two races have been the result of a dichotomous branching of a common stem. The second paper, though likewise to be followed by a complete report, gives a detailed description of the structure and general features of the island of Minikoi, which, though constantly seen by passengers on the mail steamers to Colombo, is but rarely visited by outsiders. Mr. Gardiner sums up his conclusions as to the history of the atoll, which he is inclined to regard as *sui generis*, as follows: "The island would appear to have been formed entirely by either an elevation of the whole atoll, or more probably by a change of level in the surrounding ocean. The highest point of land is 19 feet above the low tide-level, and such a height is only found in one position and may be partly artificial. Allowing amply for denudation, it is fair to suppose a change of about 4 fathoms. When first the alteration in relative level took place, it is probable that the island extended round the atoll, except perhaps where the present ships' passage exists. . . . The sandy part of Minikoi island was probably mainly an after-formation, due to washing up from the lagoon." The reef is now growing outwards on every side, and the lagoon deepening and broadening. There is no evidence of a former central island, nor any indication of subsidence throughout the Laccadives. Mr. Gardiner suggests that Minikoi has grown up as a flat reef on some submarine mound, and that the numerous deep banks of the Laccadives represent incipient stages in the formation of reefs, later stages being seen in those above sea-level.

M. Bonin's Journey across Asia.—A connected narrative of the journey across Asia from east to west, carried out by M. Bonin in 1899–1900, which has been frequently alluded to in the *Journal*, appears in the second and third numbers of *La Géographie* for the present year. Leaving Peking in April, 1899, the traveller set himself the task of following the great silk route of antiquity between China and Europe, traversed in his time by Marco Polo. Passing through the important commercial centre of Kuku Khoto, or Kwei-hwa-cheng, which might, he says, be easily reached by a railway, M. Bonin struck the Hwang-ho near the ancient citadel of Tokto (the Tenduc of Marco Polo). After an excursion south of

the river, which, contrary to the general idea, he considers quite suitable for steam navigation,* the traveller navigated its course as far as Ning-hsia in Kansu, completing the survey which he commenced in 1896. The further march led by a hitherto untraversed route through the Ala-shan, many observations being made respecting the Eleuth Mongols of this region. The Ala-shan range was crossed by a pass not hitherto marked on the map. Water was found at certain spots, generally a day's journey apart, the total number of stages to Liang-chau being nineteen, of which the most difficult were those leading across the dunes of fine sand known to the Mongols as Tengri-irissu. Between Liang-chau and Kuku-nor, M. Bonin traversed the Nan-shan by a new route, making considerable additions to our knowledge of the orography of the range, together with a special study of the Tibetan tribe of the Sitopa, or Sipakia, descended from the ancient Tanguts. At the pass of Lao-ku-chau, which reaches the limit of perpetual snow, and is dominated by the high peak of Hai-tse-shan, the aneroid showed an altitude of over 16,000 feet. Other peaks, higher than any seen by Prjevalsky, were located during this part of the journey. At Kumbum, where he rested for a time, M. Bonin inspected the whole of the monastery, including the famous golden tower, the interior of which no traveller had previously entered. From Kuku-nor he struck north-east, crossing a snow-swept range and reaching the Poku-ho, which was found to rise at least half a degree further west than is shown on our maps. Another rectification made shortly afterwards was to the effect that the Richthofen range ceases west of the Kan-chau river, though hitherto shown as reaching further east. Between Kan-chau and Ngan-si numerous mines, recently opened or discovered, were seen. Beyond Ngan-si the main road was left, and a visit paid to the Sa-chau oasis, whence a reconnaissance was made to the north-west, to the Kara-nor, now situated a degree east of the old Kara-nor of the Chinese maps. As elsewhere in this region, desiccation seems to have progressed rapidly, for it was evident that the lake had once extended farther west. North of the lake a range of mountains was seen—the Pei-shan of Gromchevski. M. Bonin suggests that the true name is Pe-shan (Northern mountains), in contradistinction to Nan-shan (Southern mountains). From this point M. Bonin struck east into the desert, where his party met with difficulties from want of water. It was here that traces of the ancient road were discovered in the form of earthen towers, 30 feet high, at regular intervals of 5 li. They were once connected by a wall, now crumbled, which seems to have been built to protect the road from the drifting sand. Ruined blockhouses are also to be seen near the road. Returning south, M. Bonin followed the Astyn-Tag track, which, as he shows, cannot possibly represent the old highway of the silk merchants. The route diverged in places from that of Mr. Littledale, ascending to a higher level on the hills in order to reach a water-supply, the streams indicated by the English traveller being dry. From the Tarim valley, where he encountered Dr. Sven Hedin, M. Bonin crossed the Tian Shan by a new route to Urumtsi, the highest pass having an altitude of 12,660 feet. The rest of the journey was made over well-known ground by Kulja and Samarcand to Kraznovodsk, on the Caspian.

AFRICA.

Geology of Egypt and the Nile Valley.—Since the establishment, in 1896, of the Geological Survey of Egypt, a considerable amount of new information has been collected, which throws some light on the topography and mode of origin

* A mine producing excellent coal, which would be most valuable both for a railway and for steamers, occurs in the mountains near the river.

of the present surface features, as well as on more purely geological questions. Explorations have been made, in the Lybian desert and elsewhere, by Mr. H. J. L. Beadnell, who last year placed the results before the International Geological Congress at Paris, in a paper of which an abstract has been given in the *Geological Magazine* for January last. Geologically, the most important discovery is that of an unsuspected unconformity between the Cretaceous and Eocene deposits, the former having, in fact, been elevated into land, often with intense folding and faulting, and experienced considerable denudation before being once more submerged. An interesting present-day feature described is the remarkable narrow belt of sand-dunes which runs for considerably more than 200 miles in a straight course, with an even breadth of 3 miles, and with sides "as well defined as if drawn with the edge of a ruler." It starts apparently west of the oasis of Moghara, and runs south-south-east, or parallel to the normal direction of the wind, through the depression of Kharga, and between the Baharia oasis and the Nile valley. The steepest sides of the dunes are those facing west, which have an angle of 30° – 31° . With regard to the origin of the remarkable depressions in the Lybian desert, such as those of Baharia, Dakhila, etc., Mr. Beadnell puts forward the theory that they are due to the denuding action exercised where the strata are soft, by changes of temperature, rain, and frosts, the resulting sand and dust being removed by wind. From geological evidence collected in the Fayum, he has proved that the ancient Lake Moeris occupied the site of the Birket el Kerun, his conclusions thus agreeing closely with those adopted by Major Brown from considerations of level. As regards the Nile valley itself, he holds that its formation was due, not to ordinary river-action, but to the same great series of earth-movements, of Lower Pliocene age, "which determined and formed the main physical feature of North-East Africa and part of Asia." This idea is not entirely new, but the confirmation of it thus supplied is valuable.

The Erlanger Expedition in North-East Africa.—Further news of this expedition (*ante*, p. 190), in the form of a letter from Herr Oscar Neumann written in December last, is given in the *Verhandlungen* of the Berlin Geographical Society (1901, No. 2). The route beyond Addis Abbaba led south along the chain of lakes, which, though visited or approached by so many travellers—Darragon, Wellby, Harrison, Leontieff—within the last few years, is still far from correctly shown on our maps. The surveys of Baron Erlanger and his party will, it seems, considerably modify the representation of this region. Between Lakes Zuai and Abaya, it is now stated that there are five and possibly six others, instead of the two shown by former travellers. Herr Neumann gives the names of four of the lakes as follows, beginning from the north: Shale (apparently the Hora of Wellby), Lauganna, or Korre (which, though said to be newly discovered, would seem to be the Lamina of Wellby), Abassi, and Daka—the two last forming a double lake. All are said to be remnants of a great Tertiary or Diluvial lake-basin, for between Zuai and Shale Herr Neumann discovered, 100 feet above the level of the Suksuk river, a deposit containing fresh-water shells. The lakes are in part connected by rivers or swampy channels, and the ground between them consists either of the former lake-bottom or of volcanic ranges which seem once to have existed in the form of islands. Many hot springs, similar to those mentioned by Böttego and Wellby, were seen near Lake Abassi. The letter was written from Abera, the newly built capital of the powerful chief Balcha, by whom the travellers were well received. He is lord of Sidamo, Jamjam, Badittu, and Amara, or all the country east of Abassi and Abaya. The former capital, Daresa, visited by Darragon, lies some distance to the south-west. The land is either elevated moorland or covered with bamboo forest. It is to be remarked that under the name Abaya

Herr Neumann apparently refers to the Pagade of Bòttego (Abai of Wellby), not the Abaya of Ruspoli and Donaldson Smith. The travellers were, at the time of writing, about to separate, Baron von Erlanger proceeding to Lake Rudolf, while Herr Neumann took the road for Fashoda.

Delimitation of the Franco-Italian Frontier on the Red Sea.—We learn from the *Politique Coloniale* (March 30, April 8–10) that a delimitation of the frontier between the French Somali Coast territory and the Italian colony of Eritrea has lately been carried out by a joint commission of the two Powers. The boundary starts from Cape Dumeirah, and runs south-west in such a way that the village of Raheita and the port of Assab fall within Italian territory. The country along the line was mapped under some difficulties, as it is described as a frightful desert without water or pasturage, making it dangerous to stray from the track in the labyrinth of steep hills through which the caravan route passes.

Visit to the Kirunga Volcanoes.—The first part of the new volume (1901) of the *Mitteilungen aus den Deutschen Schutzgebieten* contains an interesting account of a journey to the Kirunga volcanoes and Lake Albert Edward made in 1899–1900 by Herr von Beringe. It is accompanied by a map, which, owing to the scanty details yet published by other German travellers in the district, supplies valuable additions to our knowledge of its topography. Herr von Beringe's route led from Kifumbiro on the Kagera (destined, he thinks, to become the chief commercial centre of this part of Africa) in a westerly and south-westerly direction through the mountainous district of Mpororo, about which little definite information has hitherto been available, though the country was traversed in 1894 by Langheld and Richter (*Deutsches Kolonialblatt*, 1895, pp. 71, 109). Von Beringe's route seems, however, to have been a new one, as the natives had in many cases never seen a white man. The country is very broken, and the summits of the mountains reach a height of 5000 to 6000 feet, the valleys being always well watered. The people, who call themselves Wahororo, seem to be an aboriginal race, still untouched, in the west at least, by Wahuma influence. The hills are bare of trees, and are cultivated up to their summits. Between Mpororo and Ruanda the traveller passed through a lake district, the largest lake, for which only the generic term Mgesi was obtained, measuring some 15 miles by 2 or 3. Its shores are steep, and it seems to be of volcanic origin. The easternmost of the volcanoes, formerly known as Mfumbiro, but which the German traveller heard spoken of both as Kirunga and Muhawura ("far-seen"), falls to the east to two other lakes of considerable size. In this neighbourhood no trace of an escarpment to the rift-valley was seen, and in this respect the view of Mr. Scott Elliot finds confirmation. Herr von Beringe gives the native names of all the volcanoes, to most of which the generic term Kirunga is prefixed. Their number and relative positions agree fairly well with those shown by Mr. Grogan, but adjoining the highest of the series (Karisimbi) on the east, the German traveller places a table-topped summit (Visoko) not shown on Mr. Grogan's map. The old lava-fields adjoining the eastern volcanoes are exceedingly fertile and well-peopled, but the newer flows to the west are barren and waterless, and an attempt to pass to the west of Mount Namlagira (Mount Sharp of Mr. Grogan) had to be given up. The route to Lake Albert Edward passed east of Kirunga-cha-gongo and down the Ruchuru valley, while the return journey was made more to the east. The Kako, the principal headstream of the Ruchuru, was traced to a crater-lake, one of five by which the eastern Kirunga is encircled on the north, east, and south-east. The mountainous country on the north is populous and well cultivated, the inhabitants being Wahutu.

Explorations in Morocco.—The scientific results of his recent journey in Morocco are described by Prof. Theobald Fischer in the latest addition to the *Ergänzungshefte* of *Petermanns Mitteilungen*. After an introductory chapter and description of the outfit and mode of travel, Prof. Fischer gives a detailed narrative of the journey and of the scientific work of himself and his fellow-travellers, Captain E. Wimmer and Count Joachim Pfeil—a narrative of unfailing interest in its graphic descriptions of places and people, and in its skilful arrangement of matters important and unimportant to the scientific delineation of the region. The work forms an extension of the author's earlier researches in Tunis and Eastern Algeria (1886), and Western Algeria (1888), and a reconnaissance of one of the least-known regions of the world. A route-map accompanies the paper, and two photographs, one of an "Abrasionsterrasse" in the strait of Gibraltar, and another of an eroded valley at Meschrâ Ben Châillû, showing the horizontal bedding of the plateau, are reproduced. The "Vorland" region of the Atlas was crossed four times, on the lines Mogador-Marrakesch-Demnât, Demnât-Casa Blanca, Rabat-Fâs, and Fâs-Tangier. From the knowledge thus gained of its structure Prof. Fischer arrives, provisionally, at two main conclusions. First, the region is to be regarded as a true plateau; in nearly all parts, except in the immediate neighbourhood of the Atlas itself, the structure is that of horizontal beds of immense extent. Second, the plateau rests on the remains of an old worn-down mountain system. The existence of such a system has been recognized before, but Prof. Fischer shows that it occupies a much more extensive area than was supposed, and brings forward evidence that it never formed part of the Atlas, being indeed of much greater age, and appearing only at the surface where there has been great erosion and denudation. The life-history, which is fitly compared with parts of the Iberian peninsula, is briefly that of a fold-mountain system denuded by the action of the sea, covered over by sedimentary deposits, and then partly elevated. The erosion of the plateau thus formed, in which the action of wind must be regarded as an important factor, has brought the older formation to light in places where the more intense folding or greater resisting-power of its rocks left elevations at the earlier stage; these are now represented by the low ridges of the Djebilet and the Um-er-Rbia, which exhibit not only distinct surface forms, but the contrast of uninhabitable rocky districts in the middle of the habitable plain. Prof. Fischer does not commit himself as to the precise age of either the old mountain system or the superposed strata, and criticizes somewhat severely the international geological map of Europe with regard to this region. He is inclined, however, to agree with von Fritsch that the older formation is Devonian, and believes that, with certain exceptions, the younger belongs to the Cretaceous period. Beyond the plateau is the piedmont region of the sub-Atlas tableland, a strip 30 to 40 kilometres wide, closely following the trend of the mountains, and crossed by a number of mountain streams which eventually unite to form the Tensift and the Um-er-Rbia, the two rivers of the plateau. The surface of the tableland consists of diluvial deposits of varying texture. While the Atlas "Vorland" thus consists structurally of two parts, the plateau and the tableland, from other points of view it is more conveniently divided into three; the sub-Atlas belt of irrigated oases, coinciding nearly with the tableland, the belt of steppe-land, and the coast belt of cultivated land. The first is a region capable of considerable development; by extension of the irrigation system the production of crops could be largely increased. The second includes part of the plateau and exposed older rocks, and is a region of deficient rainfall, which is nevertheless capable of supporting quantities of live stock, even in summer. The third follows the coast and extends inland for a distance of 50 to 70 kilometres;

a region of exceedingly fertile soil, and in most years of quite adequate rainfall. As the result of his explorations, Prof. Fischer concludes generally that in respect of position, climate, fertility, and possibly also of mineral wealth, Marocco is the most valuable of the three Atlas countries, and that it has a greater future before it than either Algeria or Tunis.

Natural Resources of Tripoli.—A recently issued Foreign Office Report (Misc. Ser., No. 527) contains much useful information on the agriculture and natural resources of the Vilayet of Tripoli. Of the total area of 410,000 square miles (apart from the sub-province of Barka), about three-fifths are unproductive, leaving about 164,000 square miles of more or less fertile and productive soil, almost all situated between the sea and the ranges of limestone hills which mark the beginning of the southern plateau. The most fertile portion extends about 150 miles from Cape Misurata on the east to Zarvia on the west, with a breadth of 40 to 60 miles. The total population of Tripoli proper is estimated at 900,000, the majority inhabiting the coast lands and the wadis and uplands of the hills. During the rainy season, which lasts from November to March, about 19 inches of rain falls, but this is, unfortunately, so unevenly distributed, that only four good harvests out of ten can be reckoned on. At present nothing is done to utilize for irrigation the temporary torrents from the hills, which are allowed to run to waste into the sea or to form unhealthy marshes along the coast; and although there is abundance of underground water almost everywhere at little depth, no artesian wells exist, the only irrigation being by water drawn from wells by ox or camel. Of the cultivable land, it has been estimated that from 80 to 90 per cent. is not under cultivation, being allowed to remain waste through scarcity of population and lack of water, and the absence of inducement to extended cultivation due to the expense of transport in a country without roads, carts, or railways. Of the agricultural products, barley is far the most important, forming the staple food of the people. Its harvest forms the mainstay of the country, the prosperity of which for the time being depends on the quality of the crop. A fairly good harvest yields perhaps 1,400,000 bushels, a phenomenal one 2,000,000. The barley is much sought after for malting purposes, the export being principally to Great Britain; but, owing to the rarity of good harvests, this is very limited. In the years 1886–99, the total imports exceeded the exports. Other crops are wheat, dates (largely consumed in case of a failure of the barley crop), olives, oranges and lemons, madder and henna, all of which (except wheat) are exported to some extent, the remaining exports being made up principally of esparto grass, cattle, eggs, wool, skins, and hides. The total imports and exports during the last ten years have averaged between £300,000 and £400,000 yearly, the excess of total exports over imports of the natural products of the vilayet (the latter about £200,000) being made up by the caravan trade in ivory, feathers, and skins. This is probably doomed to diminution, if not extinction, in the future. To sum up, the productive power of Tripoli in excess of its own consumption is represented by a yearly value of about £160,000 only, more than half of which is the produce of a weed, incapable of reproduction, and therefore destined to ultimate extinction.

Trade of the Somali Coast Protectorate.—According to the report of Lieut.-Colonel H. Sadler on the Somali Coast Protectorate for 1899–1900, issued in January last, several adverse circumstances combined to affect the trade of the Protectorate during the year. Disturbances continued in the eastern part of the country which seriously hampered trade with the Dolbahanta country and Eastern Ogaden. The country suffered from drought in the first part of the year, and afterwards from heavy rain, which caused loss of live stock. In spite of these and other disadvantages, it is reported that during the year under review

the trade of the Protectorate reached its highest figure, exceeding the returns of the previous year by a little over 50,000 rs. An increase in imports is recorded, particularly in American grey shirting and silks. A greater demand was also shown for rice as a staple article of food; exports decreased in value owing to the slackness of the Harrar coffee trade. It is noted that the Zaila import trade with Harrar has steadily progressed. The total value of goods imported into Zaila was 34,71,904 rs., against 28,09,939 rs. in the preceding year, and the total value of exports was 30,13,712 rs. as compared with 33,23,261 rs. of the previous year. An increase in value is shown among the following articles of export: gum, skins, ivory, ghee, and pearl shells. The total value of the trade of Berbera and Bulhar for the year as reported by the vice-consul is as follows: import, 33,15,651 rs.; export, 28,71,962 rs.; total, 61,87,613 rs., showing an increase on the whole of 2,45,355 rs. on the previous year's total of 59,42,258 rs. With regard to shipping, a new line of steamers has been opened with the Persian gulf. Zaila, as a port of commerce, appears to greatly need additional means of communication with other ports. It is said to be entirely dependent on one small steamer, which calls once a week, afterwards proceeding to Berbera, whence it returns to Aden. Thus letters for Europe posted in Zaila take five days to reach Aden, a distance of 120 miles. There is no telegraphic communication, messages having to be conveyed along the coast of the Protectorate either by the above-mentioned steamer or by camel post.

AMERICA.

The Yellow Head Pass Route across the Canadian Rockies.—A recent report by Mr. James McEvoy, of the Geological Survey of Canada, on the country traversed by the Yellow Head pass across the Rocky mountains—the route originally chosen for the passage of the range by the Canadian Pacific Railway—adds considerably to our knowledge of the districts on the headwaters of the Athabasca and Fraser rivers. From Edmonton on the North Saskatchewan to Brulé lake on the Athabasca the route crosses a gently rolling plain, with burnt or green woods of cotton-wood and spruce, and frequent muskegs and bog-holes. The Pembina river, where crossed, flows in a valley excavated to a depth of 250 to 300 feet, but the McLeod, though containing at the present day a far greater volume of water, flows only 90 to 100 feet below the level of the country. The watershed between the McLeod and the Athabasca is formed by a slightly rolling ridge, which, though rising gently, attains an altitude 917 feet higher than the summit of the Yellow Head pass. The valley of the Athabasca is wide and flat, and owing to its comparatively low altitude (3000 feet), which emphasizes the effects of the Chinook winds descending from the mountains, has a drier climate than the country further east. Until Prairie creek, a little below Brulé lake, is reached, there is no approach to mountainous conditions, but beyond it Folding mountain, the first foothill of the Rocky mountains, rises up, followed by high rugged mountains with vertical cliffs, leaving a flat-bottomed valley 1 to 2 miles wide, through which the Athabasca winds in a network of sloughs. The trend of the ranges is S. 60° E. to S. 70° E., following the strike of the rocks; and the confluent streams, having the same direction, are generally arranged in pairs, each occupying one continuous valley at right angles to the main valley. One tributary, the Maligne, flows through a remarkable gorge, almost closed in at the top. The mountain slopes are for the most part bare of trees, which, except in sheltered valleys, do not ascend above 5000 feet. The trail reaches the pass by the valley of the Miette, which at high stages sends some of its water in the opposite direction to the Fraser. Flowing between the Selwyn range on the left and the Rainbow mountains on the right, the Fraser is joined from the north by the Grand Fork, looking up which a most

imposing view, dominated by Robson peak (13,700 feet), the highest known peak in the Canadian Rockies, is obtained. A little below this the river enters the great longitudinal valley, which, though occupied by different streams, preserves its main characteristics from the 49th parallel to this point and beyond. South of the Fraser it is occupied first by the McLennan, a tributary of the Fraser, and afterwards by the Canoe river, which flows in the opposite direction to the Columbia. The mountains in this direction are rugged and contain large glaciers. Erosion is going on very rapidly, and every stream is choked with mud. The climate of the valley is drier than that of the upper Fraser, but in the richer and lower lands there is moisture enough to produce good crops, and at least a fourth of the area would make rich farming land. The report also describes the plateau country east of the range, at the headwaters of the Brazeau, Pembina, and McLeod, and gives full details of the geological structure of the country.

Drying up of the Great Salt Lake.—It is stated in *Science* that measures are urgently called for to avert the disaster with which the agriculture of Utah is threatened by the imminent drying up of the Great Salt Lake. A scheme which meets with general favour is one suggested by Mr. Marcus E. Jones, who proposes to bring water into the great basin by means of a canal to be constructed from the headwaters of the Snake river. The matter would, it was thought, shortly come before the Utah legislature.

Colonel Church's "Geography of South America."—In our last number, in the general map illustrating the "Outline of the Physical Geography of South America," by Colonel Church, an error of the engraver was made in the boundary-line



Boundary - - - -
POLITICAL BOUNDARY BETWEEN BOLIVIA AND PARAGUAY.

between Bolivia and Paraguay. It is not the red line marked on the map, but the dotted one running directly west from the Apa. This is the line tacitly recognized between the two countries, although it has never been acknowledged by treaty. The error will be found corrected in the accompanying small map, which we have had prepared for the purpose of accuracy in the matter of limits between the two countries.

A Chilean Mining Department.*—The excellently got-up work of Herr Darapsky on the Chilean Department of Taltal is a valuable contribution to our knowledge of the west coast regions of South America. The author is a mining engineer, who, during a period of more than ten years, has traversed the northern portion of the old province of Atacama in all directions, and made the best use of the opportunities of scientific observation thus afforded him. While studying, for technical purposes, the geology of the country, he has not neglected the wider aspects of physical geography concerned with the present surface features in their genetic and other relations, and the result is an unusually clear and comprehensive picture, presented in chapters ii. and iii., of the two main natural divisions into which the whole of this region may be divided—the desert and the *puna*. In the department of Taltal, the dividing line, formed by the first continuous chain of the Andes, runs in about 69° or $69^{\circ} 15'$ W., the high Cordillera region to the east of this line being now generally known as *puna*, while the desert is the lower but still fairly elevated tract between the Cordillera and the coast, from which its outer edge rises like a steep wall. Herr Darapsky's account of the *puna* region, with its numerous salt lagoons and volcanic peaks and ridges, appeared some time ago in its essential features in the *Zeitschrift* of the Berlin Geographical Society, and has already been alluded to in the *Journal* (vol. xv. p. 538). A valuable chapter in the present work is that on the climatic conditions of the department, which in their striking contrasts and anomalies present a close parallel with those of German South-West Africa. The next three chapters are devoted to a description of the mineral riches of Taltal, especially the deposits of saltpetre, the origin of which is carefully discussed. Herr Darapsky thinks that the present deposits are but the remnants of a former more extensive covering, which was formed at a definite geological period, though certainly not, as was once thought, from a general covering of the surface by the waters of the sea. The fact that these deposits have been better preserved here than anywhere else in the world is to be mainly ascribed to the very extended period through which a dry climate has prevailed. The wealth of Taltal in metals, which include almost all the useful kinds known, is dealt with in the eighth chapter. The work contains a striking series of illustrations reproduced by photogravure, and an abundant supply of maps, sections, and panoramas.

Belgian Enterprise in the Tocantins Basin.—The newly awakened enterprise of the Belgians in Africa and the Far East is now to be extended, as we learn from the *Mouvement Géographique* for March 17, to South America, a great project having been set on foot for the exploitation of the basin of the Tocantins in Brazil. The upper courses, both of the Tocantins and its great tributary the Araguaya, are shut off from intercourse with the coast by reason of the falls and rapids which obstruct their lower courses as well as the united stream below the confluence. This defect, which has much impeded the development of the state of Goyaz, it is proposed to remedy by the construction of a railway from Alcobaca to Praia da

* 'Das Departement Taltal (Chile). Seine Bodenbildung und Schaetze.' Von L. Darapsky. Berlin: Reimer, 1900.

Rainha, parallel to the lower Tocantins, and by the removal of obstructions to navigation between Praia da Rainha and Porto Nacional on the Tocantins, and Santa Maria on the Araguaya, so that both rivers will be accessible to steamers drawing 1·3 foot. The company formed so far back as 1891 for the purpose of carrying out these objects, under the name "Companhia Viação Ferrea e Fluvial do Tocantins e Araguaya," has lately, for the purpose of raising the necessary capital, decided to make over the valuable concessions granted by the Brazilian Government to a Belgian company, which is commencing operations by the despatch of an exploring expedition under M. Léon Thierry, whose staff was to leave Antwerp on March 18. M. Thierry has previously been connected with the "Société du Haut Congo."

AUSTRALASIA AND OCEANIC ISLANDS.

Distribution of Art in Oceania.—Under the title of "Die Kulturformen Oceaniens," Herr L. Frobenius contributes a series of three valuable papers to *Petermanns Mitteilungen* for September, October, and November, 1900 (vol. 46, Nos. ix., x., xi.). They form a continuation of the studies of cultural appliances which appeared in vol. 41 (1896) of the same periodical, and are of the same comprehensive character. Here Oceania, as is usual with foreign writers, is taken in its widest sense, comprising "Indonesia," that is, Malaysia with the Philippines in the west, Australia in the south-east, Micronesia in the north-east, and Melanesia with New Guinea in the east. From Indonesia, presumable centre of development of the cultural forms, three main highways, here called "axes," lead to Australia ("southern axis"), to Micronesia ("northern axis"), and along the New Guinea coast to East Melanesia, thence ramifying over the whole of Polynesia ("central axis"). To the cultural forms specially distinctive of the southern and central zones are applied the terms "Nigritic" and "Pre-Malay" respectively, all the rest being called "Malayo-Asiatic." This terminology cannot be regarded as satisfactory—indeed, is open to more than one serious objection, and the author tells us himself that the expression "Malayo-Asiatic" especially was adopted with great reluctance for want of a better. It seems to exclude Nigritic forms, which are, nevertheless, in some respects typical of the northern zone, and more particularly of Indonesia, where they originated. But once the terms are defined, all confusion is removed, while the whole subject is treated with a clearness and accuracy which are beyond all praise. In the first paper are described the various kinds of stone axes, of drums, weaving materials (cotton and all sorts of vegetable fibres), houses, river and sea craft, characteristic of the several cultural areas. The second is occupied exclusively with missiles, and especially the mechanical contrivances, such as the sling, bow, and blowpipe, by which stones, darts, spears, arrows, and the like, are hurled against the enemy. Weapons thrown with the hand—clubs, boomerangs, and other kinds of throwing-sticks—are also dealt with, and a special section is devoted to the historic evolution of all these implements. In the third paper a very full account of the endless varieties of shields and bucklers occurring in the Oceanic domain is followed by a highly instructive essay on the numeral systems of the Oceanic peoples, after which comes a very clear account of the different processes and appliances for kindling fire. The whole subject is dealt with in considerable detail, and in such perspective that, as when surveying the Pitt-Rivers collection at Oxford, the reader is often enabled to see the natural development of advance from more primitive types—the passage, in the language of evolutionists, from the homogeneous to the heterogeneous. This is specially seen in the careful treatment of the shield and of the boat, to which great attention is rightly paid, as in no

other field of human activities can these appliances be more conveniently studied. Here we plainly see how the handle of the shield was the determining motive of many later modifications, and how the floating log passed through the dug-out to the single and double Polynesian outrigger, the decked vessel, the prau and sailing-ship. The sail itself is separately discussed, its development from the triangular form attached on one side to the mast, to the square form as in the Chinese junk, and other later improvements, being diligently followed, so to say, from creek to creek, from bight to bight, from the inland seas to the open waters of this insular world. The series of monographs, as they may well be called, concludes with a few summary remarks on the cultural elements of the three specified zones, the object being to determine as far as possible the actual range of the types specially characteristic of these several zones. Thus the boomerang and allied forms of throwing-sticks, all turning on their axis in flight, some mere playthings, others hunting or offensive weapons, are shown to extend in Australia as far south as about $15^{\circ} 30'$ S., north-westwards to the Aru islands (the palu-palu), and eastwards to the New Hebrides (the curious kavas made of coral, but bent like a boomerang, and about 18 inches long). Although the most recent in their evolution, the Malayo-Asiatic culture forms are found to be the most widely distributed, but everywhere associated with earlier, and in some cases even with the most primitive, types. Thus they occur in Indonesia in juxtaposition with still surviving early Asiatic, pre-Malay, and Nigritic implements and processes. They range also into Micronesia and Polynesia, but as a rule thinning out in the direction of the east. An interesting case is the potter's art, which flourishes in Indonesia, is still practised in the Pelew group, but has already died out in Yap, where, however, clay vessels are still familiar objects, while east of this island all traces of the art and its products have long disappeared. The papers are accompanied by eighteen small-scale maps, illustrating the distribution of the objects, etc., described.

Memorial of the Observation of the Transit of Venus, 1769.—The memorial erected by Captain Cook at Tahiti, after the observation of the transit of Venus during the navigator's first voyage, has recently been restored through the joint efforts of the Royal Society and our own Society. A plate has also been fixed with the following inscription: "This memorial, erected by Captain James Cook to commemorate the Observation of the Transit of Venus, June 3, 1769, was restored and fenced round, and this plate was placed here by the Royal Society and the Royal Geographical Society in 1901."

POLAR REGIONS.

Launch of the German Antarctic Ship.—The ship which has been specially built for the German Antarctic Expedition at the Howaldt shipbuilding yard at Kiel, was successfully launched on April 2 in the presence of a large assembly, the ceremony being performed by Baron von Richthofen. The ship has been named the *Gauss*, after the great German mathematician, whose work on Terrestrial Magnetism, published in 1838, gave the impetus to antarctic research which had its outcome in the three great expeditions of Ross, D'Urville, and Wilkes. The *Gauss* is slightly smaller than the *Discovery*, the displacement being 1450 tons as compared with 1750 in the case of the British ship. The length between perpendiculars is 151 feet, and the beam 35, this last being 1 foot greater than that of the *Discovery*. The ship has triple-expansion engines of 300 indicated horse-power at ordinary, or 500 horse-power at forced, draught, giving an estimated speed, with a steam-pressure of $26\frac{1}{2}$ lbs., of 7 knots. As in the case of the *Discovery*, there is an outer and inner hull, the former having a thickness of 14 inches at the water-line. It is in three layers, the outermost of greenheart,

the two others of oak. The ship has been built with a view to accommodating a crew of thirty to thirty-two persons, with stores for three years, fifty dogs, and complete equipment for the scientific work contemplated. Among other apparatus will be a windmill, a naphtha boat, a captive balloon, and materials for the construction of a dwelling-house and four observatories for use at the winter station. In the interest of the magnetic observations, iron has been employed sparingly, and even so coated with zinc, copper taking its place as far as possible. The ship will be lighted by electricity, and warmed by steam-pipes. It will have considerable sail power, to which the use of steam is regarded as merely auxiliary.

Communicating with Peary.—We learn from the *Brooklyn Standard Union* for March 29 that arrangements have been made by the Peary Arctic Club for the despatch, for the second year in succession, of letters to Peary, now spending the third year since starting on his present expedition. The mail had been forwarded to Dundee for despatch by the whalers from that port, five of which are proceeding this year to the Smith sound region. Five copies of the letter have therefore been sent, and it is hoped that one, at least, will safely reach Cape York, from which point it will be carried north by the Eskimo.

Explorations in Spitsbergen: Erratum.—On p. 434, *ante*, line 14, the height of the pass ascended by the Swedish explorers should be 4166 feet, not 8860 feet. The general direction was east from the head of East fiord, though the last part of the route was south-east.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Snow-waves.—Mr. Vaughan Cornish has returned from an expedition in search of snow-waves in Quebec, Manitoba, the North-West Territories, and British Columbia. These waves were found to be well developed on frozen rivers and lakes, and on the open prairie, where photographs and measurements were taken. They are produced without the intervention of any obstruction, and sometimes occur in groups or trains of waves comprising a hundred succeeding ridges. Their movement is sufficiently rapid to be readily visible. In certain conditions of the snow true ripples are also formed which are similar to the ripples produced by wind in loose dry sand. In both ripples and waves the steeper face is on the lee side. In moist or coherent snow, such as usually falls in England, the wind carves the surface into ridges which have their steep face on the windward side.

Zoogeographical Regions.—A paper by Dr. Arnold Jacobi in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin* (xxxv., 1900, pp. 147–238) contains a critical review of recent work dealing with the distribution of animals. No faunal division of the world will hold for all groups of animals, because these have appeared at very different ages, and the lands have undergone great changes of outline since the earlier forms first flourished. Confining attention to mammals and birds, the world consists of three great realms—Notogæa, Arctogæa, Neogæa, which correspond with the three chief centres of their development. Many striking facts in present distributions cannot be fully explained by taking into account only migrations and climatic conditions, but should also be studied with reference to possibilities of food-supply. For the division of the three realms into regions, statistics of mutually common or exclusive species are not so important as considerations of genetic relationships. Dr. Jacobi adopts the holarctic region, and calls North America south of 45° a neoboreal region, which he includes in the Neogæic realm. He points out that recent researches have shown that Asiatic species are more important in the Malay archipelago than Australian ones, and that the line separating Arctogæa from Notogæa must be moved eastwards from Lombok

strait to the Molucca, Banda, and Timor seas. We cannot give up Wallace's line without a sigh of regret. Might not the name be retained for the boundary between *Arctogæa* and *Notogæa*? Dr. Jacobi makes a special study of several regions, and summarizes the results of recent investigations in them as follows: I. There are a number of characteristics common to the Ethiopian and Oriental regions, which owe their origin in most cases to the latter; but there is no proof of a former Lemurian continent, which formed a bridge by which the animals and plants passed between India and Africa. II. There is much in common between the forms, or at least between the systematic groups, of animals and plants in the high mountains of Africa, Europe, and Asia. III. The high mountain fauna of the Philippines has a marked sub-arctic character, which is obviously connected with that of the Himalayas. Traces of this fauna are also found in the mountains of the Greater Sunda islands. Probably these types were driven from India towards the Malay archipelago by a cold period. IV. The great mountain mass of Central Asia is distinguished by an astonishing richness in peculiar types, which is all the more remarkable when we consider the unfavourable environment. It appears to be the distribution centre of many groups. V. The fauna of Japan has three constituent parts—tropical, older Manchurian endemic, and younger holarctic—whose distribution over the archipelago throws light on its geological history. VI. After the great Ice Age Europe received its plants and animals from three sides, and there were new immigrations from the south and especially from the east, owing to the gradual equalizing of the environment in Europe and Western Asia. VII. The avifauna of the Galapagos clearly shows that the differentiation following physical separation, or isolation, in Moritz-Wagner's sense, is the first and essential condition for the formation of new species. A discussion of fifteen migration regions, which are shown on the map, is followed by a study of the distribution of jays (*Garrulus*) and bullfinches (*Pyrrhula*), illustrated by two maps. The areas of distribution of organic forms are grouped into universal, zonal, littoral, marginal, insular, fluviatile, and vertical; and the areas where closely allied types live without sexual or social intercourse with each other in the same region, distinguished from those where one form is restricted to a very limited district, and from the intermediate discontinuous distribution, *e.g.* of the tapirs. A brief note on the form of the bio-geographical region closes the paper.

GENERAL.

Malarial Infection of Europeans.—A further instalment of reports to the Malaria Committee has been published by the Royal Society in the form of a paper, with two short notes appended, by Mr. S. R. Christophers and Dr. J. W. W. Stephens. The main paper consists of a discussion of observations and experiments showing that the native is the prime agent in the malarial infection of Europeans. The authors found, firstly, that in all the native villages examined, 50 to 90 per cent. of the children were infected with malaria, and a considerable proportion of the infected children contained crescentic bodies, which rapidly took the form requisite for the transmission of human malaria to the mosquito. Secondly, in all the villages anopheles were present, even when breeding-places had not been in existence for varying periods up to three months. A certain proportion of the anopheles found were always infected with the mosquito phase of the parasite, and not only each village as a whole, but with rare exceptions each individual hut, contained both infected children and infected anopheles. These conclusions, which are here chiefly based on observations near Accra, are supported by observations made by the authors in various regions in British Central Africa, Sierra Leone, and the Gold Coast, and they therefore probably prevail universally.

throughout tropical Africa. They lead at once to a result of the highest importance—that Europeans can escape infection by strict avoidance of native villages and huts. Settlements and towns must have no adjoining native quarters, and travellers must camp and sleep in places remote from human habitation.

Admiralty Chart Agency.—It may be of use to Fellows of the Society to mention that Mr. J. D. Potter, the agent for the sale of Admiralty charts, has removed from 31, Poultry, to 145, Minories, and that the latter is therefore now the address from which those charts are to be obtained.

OBITUARY.

Professor Paul Chaix.

WE regret to announce the death, which occurred on March 28, at the age of ninety-three years, of our oldest Hon. Corresponding Member, Prof. Paul Chaix, of Geneva, whose name has long been a familiar one in geographical circles. His connection with our Society dates back almost to its foundation, his election as Corresponding Member having taken place in 1837, or no less than sixty-four years ago.

Paul Chaix was the son of Georges Chaix, whose family had relations both with Dauphiné and with Spain; his mother belonging to an old family in Geneva, to which city the family removed from Dauphiné in 1816. After a distinguished career at the Geneva Academy, he became tutor in succession to various young men of note, including the Duke of Richmond, who was his pupil (in London and at Goodwood) from 1829 to 1832. In 1836, after completing his studies at Paris, Chaix returned to Geneva, and was appointed *Maitre de Géographie et d'Histoire* at the Industrial College, geography being a subject which had already attracted his attention. In 1839 the first edition of his '*Précis de Géographie Élémentaire*,' which has now reached its fourteenth edition, appeared, followed two years later by his '*Atlas de Géographie*.' In 1846 the revolution at Geneva deprived Chaix of his principal functions, and he occupied the leisure thus obtained in a journey to Egypt (1846-47), and in studies on the history of South America in the early days of the conquest, on which he published a work in two volumes in 1853. In 1868 he became Professor at the Gymnasium at Geneva, and in 1872 Honorary Professor at the University. He retired from active work in 1882, but continued to give scope to his fondness for foreign travel until several years later.

In addition to the works already mentioned, Prof. Paul Chaix published, during his residence in London, his '*Carte de la Savoie*,' and in 1847 a series of '*Lettres des Bords du Nil*,' contributed to the *Bibliothèque Universelle*. His '*Hydrographie de l'Arve*' may also be specially mentioned. Besides these, he contributed to various reviews and journals, especially to *Le Globe*, the journal of the Geographical Society of Geneva, a large number of smaller articles. To our own Society he presented several papers, published in the *Journal* between 1849 and 1857, including notes on the Nile and on Hannibal's passage across the Alps.

Prof. Paul Chaix married in 1848, and had one son, Prof. Emile Chaix, also well known as a geographical writer, and three daughters, all still living.

Major-General G. H. Saxton.

The death has lately occurred of Major-General Saxton, formerly of the Indian Army, who, during his service in India in the third quarter of the nineteenth

century, was well known for his excellent work in connection with the Survey of India. Born in 1820, and educated at a private school in Shropshire, George Harper Saxton obtained a cadetship in the Madras army in 1837, and soon gained promotion, distinguishing himself especially by his linguistic proficiency. After holding for a time the adjutancy of his regiment, the 38th Madras Native Infantry, he was, in 1849, selected to take charge of the Ganjam survey party, one of the oldest branches of the Survey of India, and remained in this important position until his retirement, under the age rule, in 1874. During this time the whole province of Orissa was mapped under his auspices, the work being carried out with great success and thoroughness. Among other work which fell to his lot was the settlement of various boundary disputes between native states. Since his retirement he had lived at Emsleigh, Exeter, taking an active interest in various local committees, and giving much of his time to correspondence on the subject of bimetallism, in which he took a warm interest, and on which he published several pamphlets. He became a member of our Society in 1898.

Henry Schlichter, D.Sc.

It is with great regret that we record the premature death, from the results of malarial fever, of Dr. Henry Schlichter, well known to our readers as a zealous student of African geography, past and present. We believe that Dr. Schlichter never fully recovered from the effects of illness contracted during his expedition to South Africa in 1897-98, but though he travelled in the hope of benefiting by a change of air, he finally succumbed at Waiblingen, Würtemberg, at the beginning of April last.

Dr. Schlichter was born and educated in Germany, but after graduating at Stuttgart University, he came to this country and eventually became naturalized as a British subject. For some years he held the post of consulting scientist to the Jaeger Company, but he devoted much of his time to study and research on geographical questions, especially those connected with Africa and the history of geography generally. In 1891 he read before our Society an important paper on Ptolemy's 'Topography of Eastern Equatorial Africa,' in which he showed that the descriptions of that geographer were quite capable of being fitted in with the facts brought to light by modern discovery, and were therefore based on actual knowledge. A nearly allied subject to which he paid special attention was that of the ruins indicating the existence of ancient gold-mines in South-East Africa, and on this he contributed several papers, both in *Petermanns Mittheilungen* and in the *Geographical Journal*, after the expedition of Mr. Theodore Bent had re-directed public attention to the problem presented by the ruins, throwing valuable light on the ancient commercial intercourse between Arabia and Eastern Africa. About the same time he directed his attention to the more practical question of the employment of photographic processes by explorers for purposes of survey—a method which has since reached so important a development. A preliminary paper by him attracted considerable attention at the meeting of the British Association in 1892, and the method was afterwards more fully described in a paper published in the *Geographical Journal* in November, 1893.

In 1897, Dr. Schlichter found an opportunity of continuing his researches on the gold-mining ruins at Zimbabwe by personal investigation on the spot, having received the appointment of geologist to the British South Africa Company. During his examination of the mineral resources of the company's territory, he traversed some little-known districts in Matebeleland and Mashonaland, making for the first

time a careful examination of the ruins in the Mombo district of the former, as well as of the better-known ruins at Zimbabwe and elsewhere. The results of these journeys were placed before our Society in a paper read in February, 1899, and published in the *Journal* for April of that year. During this expedition Dr. Schlichter discovered considerable deposits of gold, and he was, up to his death, a zealous champion of the prosecution of mining enterprise in Rhodesia.

CORRESPONDENCE.

Nomenclature of Spitsbergen.

IN view of the vexed question of the correct nomenclature of Spitsbergen bays and capes, the following list is worth putting on record. I copied it in the Record Office, where it is preserved in 'S.P. Domestic, Interregnum,' vol. 179 (January, February, 1658), No. 11 (2). It is annexed to a report of a discussion in the Council of State, relative to whaling matters, on December 14, 1657. It is therefore unusually authoritative. The latitudes will be found very inaccurate.

"THE NAMES OF THE SEVERALL HARBORS IN GREENLAND AND THE DEGREES OF
LATITUDE.

	Degrees.
Point Looke Out being in the height of	76½
Hornesound and Mottle Bay	77
Bell Sound and Bottle Cove	77½
Greenharbor and Port Nick	78
Osbornes Inlett	78½
Fowle Sound	79
Cove Comfortlesse	79½
Deere Sound	79½
Crosse Road	79½
Crooke Haven	79½
Knotty Point	79½
Maudlyn Sound	79½
Faire Haven	79½
Foxes Point, etc.	80
Foreland	79
Sir Thomas Smith's Bay	78½
Pudding Bay to the Eastwards	77
Deicrowes Bay and others	77½
Duckes Cove	77½
Hunting Bay	78
Potty Harbor	77"

Point Look-out is South cape. Mottle bay is a cove in the north side of Horn sound. Bottle cove (Willem van Muyden's haven) is identified from Pelham's 'God's Power and Providence' as a cove open to the south-west in the north shore of Bell sound, outside Axel island. Port Nick is Safe haven. Osborne inlet is St. John's bay. Cove Comfortless is English bay. Fowl sound is Foreland sound. Deere sound is King's bay. Crookehaven may be Hamburger bay. Knotty point is the point between Magdalena (Maudlyn) bay and the South gat. Foxes point is Flat hook. Sir Thomas Smith's bay is the north end of Foreland sound. I cannot identify Pudding bay (in Wybe Jans water). Deicrowes bay is in Edge island; so is Duke's cove (see *Geographical Journal*, June, 1900, p. 631, *note*). I cannot identify Hunting bay and Potty harbour.

MARTIN CONWAY.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Ninth Ordinary Meeting, March 25, 1901.—Sir T. H. HOLDICH, R.E.,
K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*Count Lutzow; Victorino de la Plaza; John Waite.*

The Papers read were:—

“Journeys in the Linyanti Region.” By Percy C. Reid. “Exploration and Survey in the Sobat Region.” By Major H. H. Austin, R.E.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
O. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.

Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the “*Journal*.”

EUROPE.

Alps.

Coolidge.

Climbs in the Alps made in the years 1865 to 1900. By W. A. B. Coolidge. [100 copies privately printed.] Size 8 × 5, pp. 24. *Presented by the Author.*

This is merely a list of the climbs made by the author.

Alps.

Jahresb. G. Ges. München (1898-99): lxxiv-lxxvii.

Finstertwalder.

Ueber die neuesten Ergebnisse der Gletscherforschung in den Ostalpen. Von Prof. Dr. S. Finstertwalder.

Austria—Bosnia, etc. *B.G.S. Philadelphia* 3 (1901): 21-50.

Davis.

An Excursion in Bosnia, Hercegovina, and Dalmatia. By W. M. Davis. *With Illustrations.*

The excursion was made with Prof. Penck and a party of geographical students in 1899.

Austria—Karst.

M.G. Ges. Wien 43 (1900): 381-390.

Trampler.

Drei Dolinengruppen im mährischen Karst. Von R. Trampler. *With Plans.*

Austria—Rainfall, etc.

Hydrographischer Dienst in Österreich. Jahrbuch des k. k. hydrographischen Central-Bureaus. VI. Jahrgang, 1898. Wien, 1900. Size 14½ × 11. *Maps and Diagrams. Presented by the k. k. hydrographische Central-Bureau, Vienna.*

This valuable publication gives the full results of rainfall, water-level, and

temperature observations for the various river-systems of Austria. Its scope is slightly extended as compared with the previous volume.

Balkan Peninsula. *Norske G. Selsk. Aarb.* 11 (1899-1900): 17-33. **Broch.**

Paa høifjeldet mellem Serbien og Bulgarien af professor Olaf Broch. *With Illustrations.*

On the highlands between Serbia and Bulgaria.

Balkan Peninsula. *M.G. Ges. Wien* 43 (1900): 391-396. **Levačić.**

Ueber die Umschreibung des griechischen θ , δ und χ in den geographischen Namen der Balkanhalbinsel. Von K. u. K. Hauptmann Johann Levačić.

The writer defends his system of transliteration against the criticisms of Prof. Penck.

Balkan Peninsula—Language. *Riv. G. Italiana* 8 (1901): 42-48. **Baldacci.**

La lingua italiana in relazione al nostro commercio nell' Albania e nell' Epiro. Di A. Baldacci.

Urges the importance for Italian trade of the diffusion of the Italian language in the Balkan peninsula.

Balkans. *Jahresb. G. Ges. München* (1898-99): lxxii-lxxiii. **Goetz.**

Ueber seine Wanderung im Centralbalkan. Von Prof. Dr. W. Goetz.

Belgium and France. *Globus* 79 (1901): 94-97. **Bischoff.**

Die germanisch-romanische Sprachgrenze in Belgien und Nordfrankreich. Von Prof. H. Bischoff.

Belgium—Ghent. **Hallett.**

Trade of Ghent for the year 1899. Foreign Office, Annual No. 2540, 1900. Size $10 \times 6\frac{1}{2}$, pp. 10. *Price* 1d.

Europe—Anthropology. **Pasanisi.**

B.S.G. Italiana 1 (1900): 813-836, 929-956, 1026-1066.

Le Razze d'Europa. Nota del dott. Fr. M. Pasanisi.

Europe—History. **Helmolt.**

Weltgeschichte. Herausgegeben von Hans F. Helmolt. Siebenter Band. Westeuropa, Erster Teil. Von Prof. Dr. Richard Mayr, Dr. Armin Tille, Prof. D. Wilhelm Walther, Prof. Dr. Georg Adler und Prof. Dr. Hans von Zwiédineck-Südenhorst. Leipzig and Wien: Bibliographisches Institut, 1900. Size $10\frac{1}{2} \times 7$, pp. xii. and 574. *Maps and Illustrations.*

This is the third volume so far issued of the general history of mankind, of which the first was noticed in vol. xv. of the *Journal* (p. 446), and which is intended to present a picture of the general progress of the human race. The present volume, which, like the former ones, is illustrated by maps, deals in the first section with the commerce and general economic conditions of Western Europe since the crusades.

France. *Ann. G.* 10 (1901): 17-26. **Bleicher.**

La vallée de l'Ingrassin et ses débouchés dans la vallée de la Meuse. Par Prof. G. Bleicher.

The writer combats the idea adopted among others by Prof. W. M. Davis, that the upper Moselle once flowed into the Meuse near Toul. See note, *ante*, p. 524.

France—Bourg-sur-Gironde. *B.S.G. Com. Bordeaux* 26 (1900): 454-459. **Imbert.**

Excursion à Bourg-sur-Gironde. Par M. Louis Imbert.

France—Brittany. *Questions Dipl. et Colon.* 11 (1901): 1-16. **Layec.**

La Bretagne et la colonisation française. Par M. A. Layec.

France—Coalfields. *Naturw. Wochenschrift* 16 (1901): 16-18. **Söhle.**

Bericht über der im Anschluss an den VIII. internationalen Geologen-Congress zu Paris nach den Kohlenrevieren von Commentry und Decazeville stattgehabten Excursionen. Von Dr. Söhle.

France—Gascony. *B.S.G. Com. Bordeaux* 27 (1901): 25-34, 45-55. **Saint-Jours.**

État ancien du littoral gascon. Par le Capitaine Saint-Jours. *With Maps.*

France—Geology. *C. Rd.* 132 (1901): 184-187. **Glangeaud.**

Les dômes de Saint-Cyprien (Dordogne), Sauveterre et Fumel (Lot-et-Garonne). Note de M. Ph. Glangeaud.

France—Geology. *Geolog. Mag.* 8 (1901): 59-65. **Johnston.**

Some Geological Notes on Central France. By Miss M. S. Johnston. *With Plates.*

- France—Gironde.** *B.S.G. Com. Bordeaux* 26 (1900): 194-201. **Courty.**
Climatologie bordelaise de l'année 1899. Par F. Courty.
- France—Hautes-Pyrénées.** *C. Rd.* 131 (1900): 1255-1258. **Bresson.**
Sur l'âge des massifs granitiques de Cauterets et du Néouvielle (Hautes-Pyrénées) et d'une partie des formations anciennes qui les bordent. Note de M. A. Bresson.
- France—Hérault.**
Géographie générale du Département de l'Hérault publiée par la Société Languedocienne de Géographie. Tome Troisième. Histoire générale. 1^{re} Fasc. L'Hérault aux temps préhistoriques. Montpellier, 1900. Size 10 × 6½, pp. 198. *Map and Illustrations.* Price 3 fr. Presented by the Société Languedocienne de Géographie.
Continuation of the work begun in 1891 (cf. ante, p. 84).
- France—Lille.** *A travers le Monde, Tour du Monde* 7 (1901): 33-35. **Houbron.**
La foire de la Braderie à Lille. Par M. G. Houbron. *With Illustrations.*
On a section of the annual fair held at Lille early in September.
- France—Marseilles.** *B.S.G. Marseille* 24 (1900): 259-263. **Turquan.**
Marseille seconde ville de France. Par M. Victor Turquan.
Forecasting the probable results of the approaching census of France, the writer thinks that Marseilles will have regained the distinction of being the second city in France, held of late years by Lyons.
- France—Meurthe et Moselle.** *B.S.G. de l'Est* 21 (1900): 181-204. **Bleicher.**
Le plateau central de Haye. Étude de géographie physique régionale. Par M. Bleicher. *With Map and Plates.*
A study of the physical features of the district west of Nancy, between the Meurthe and the Moselle.
- France—Saône.** *Ann. G.* 10 (1901): 27-45. **Barré.**
La haute vallée de la Saône. Par Prof. O. Barré. *With Maps.*
- France—Saône.** *Ann. G.* 10 (1901): 46-67. **Tavernier.**
Étude hydrologique sur le bassin de la Saône. Par H. Tavernier. *With Maps and Diagrams.*
- France—Silk-Production.** *B.S.G. Lyon* 17 (1901): 36-43. **Groffier.**
La Production de la Soie en France. Par M. V. Groffier.
- France—Var.** *B.S.G. Marseille* 24 (1900): 264-281. **Delmas.**
La vallée de la Bresque (Var). Par M. Jacques Delmas.
- Germany—Baltic Coast.** *Q.J. Geol. S.* 57 (1901): 1-19. **Bonney and Hill.**
Additional Notes on the Drifts of the Baltic Coast of Germany. By Prof. T. G. Bonney and the Rev. E. Hill. *With Sections.*
- Germany—Bavaria.** *Jahresb. G. Ges. München* (1898-99): 37-82. **Erk.**
Die Klimatologische Landesforschung in Bayern. Von Fritz Erk. *With Diagrams.*
- Germany—Bavaria.** *Jahresb. G. Ges. München* (1898-99): 83-93. **Oberhummer.**
Nachträgliches zur Aventin-Karte. Von Eugen Oberhummer. *With Plate.*
Additional observations respecting Aventin's map of Bavaria (1823), published by the Munich Geographical Society in 1899.
- Germany—Coalfields.** *Naturw. Wochenschrift* 16 (1901): 1-6. **Holzapfel.**
Zusammenhang und Ausdehnung der deutschen Kohlenfelder. Von E. Holzapfel.
- Germany—Hessen.** *Sitzb. A. W. Berlin* (1900): 1023-1039. **Bauer.**
Beiträge zur Kenntniss der niederhessischen Basalte. Von Prof. Dr. M. Bauer.
- Germany—Hessen.** *G.M. Hessen*, Parts i. and ii. (1900): 5-102. **Krausmüller.**
Die Volksdichte der Grossherzogl. Hessischen Provinz Oberhessen auf Grund der Volkszählung vom 2. Dezember, 1895. Von Dr. Georg Krausmüller.
- Germany—Northern Plain.** *Zemlevedenie* 7 (1900): 1-28. **Adler.**
The North-German Lowland. By B. F. Adler. [In Russian.] *With Maps and Illustrations.*
- Germany—Northern Plain.** *Verh. Ges. Erdk. Berlin* 28 (1901): 116-124. **Wahnschaffe.**
Herr Professor Dr. F. Wahnschaffe: Die Ursachen der Oberflächengestaltung des norddeutschen Flachlandes.

- Germany—Pomerania.** *J.R. United Service I.* 45 (1901): 144-161. **Gunter.**
The German Imperial Manœuvres in Pomerania. Compiled by Lieut.-Colonel E. Gunter. *With Maps.*
- Germany—Prussia.** **Hellmann.**
Regenkarte der Provinzen Westpreussen und Posen. Mit erläuterndem Text und Tabellen. In amtlichem Auftrage bearbeitet von Prof. Dr. G. Hellmann. Berlin: D. Reimer (Ernst Vohsen), 1900. Size $10\frac{1}{2} \times 7$, pp. 28. *Map. Presented by the K. Preuss. Meteorologischen Institut, Berlin.*
- Germans and Italians.** **Cipolla.**
Rendiconti R.A. Lincei 9 (1900): 369-422, 517-563, 567-603.
Della supposta fusione degli Italiani coi Germani nei primi secoli del medioevo. Del Carlo Cipolla.
- Glacial Erosion.** *P. Boston S. Nat. Hist.* 29 (1900): 273-322. **Davis.**
Glacial Erosion in France, Switzerland, and Norway. By W. M. Davis. *With Plates.*
- Greece—Seriphos.** *B.S.R. Belge G.* 24 (1900): 533-558. **Hautteœur.**
L'île de Sériphos. Par M. H. Hautteœur. *With Map.*
- Holland—Lauwerzee.** **Kuyper.**
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 1-6.
Indijking der Lanwer(s)zee. Door J. Kuyper. *With Map.*
On the proposed reclamation of the Lauwerzee, the large opening on the coast between the Ems and the Zuider Zee.
- Holland—Zeeland.** *Globus* 79 (1901): 72-75. **Hansen.**
Das Wasserwesen der niederländischen Provinz Zeeland. Von R. Hansen. *With Map and Illustrations.*
- Hungary—Carpathians.** *C. Rd.* 132 (1901): 360-363. **Martonne.**
Nouvelles observations sur la période glaciaire dans les Karpates méridionales. Note de M. E. de Martonne.
- Hungary—Carpathians.** *Deutsche Rundschau G.* 23 (1901): 169-172. **Reiner.**
Die Babia Góra. Von Dr. Julius Reiner.
- Italy.** **Davis.**
Fault Scarp in the Lepini Mountains, Italy. By W. M. Davis. (B. Geolog. S. America, vol. ii. pp. 207-216. *Plates.*) Rochester, April, 1900.
- Italy—Health.** *Climate* 2 (1901): 61-67. **———**
The Malaria Experiments in the Campagna. *With Illustrations.*
- Italy—Tiber.** *B.S.G. Italiana* 2 (1901): 246-251. **Perrone.**
La piena del Tevere del dicembre 1900. Nota del sig. Eugenio Perrone.
The Tiber flood of December 2 last was one of the highest ever known.
- Italy—Tuscany.** **Carmichael.**
In Tuscany. Tuscan Towns, Tuscan Types, and the Tuscan Tongue. By Montgomery Carmichael. London: John Murray, 1901. Size $8\frac{1}{2} \times 5\frac{1}{2}$, pp. xviii. and 356. *Map and Illustrations. Price 9s. net. Presented by the Publisher.*
An attractively written book, in which the writer endeavours to present to the reader a truthful impression of Tuscany and the Tuscans in general. The cities and districts described are, in the main, those not touched by the majority of tourists, nothing being said, *e.g.*, of Florence and Siena.
- Italy and Scandinavia.** *J. Anthropol. I.* 30 (1900): 89-94. **Montelius.**
On the Earliest Communications between Italy and Scandinavia. By Prof. Oscar Montelius. *With Plates.*
- Lapland.** *Rev. G.* 48 (1901): 104-113. **Vinci.**
Le renne et le Lapon. Par V. Gaudard de Vinci.
On the threatened extinction of the reindeer in Europe, and with it of the Lapp race.
- Mediterranean—Crete.** *Contemporary Rev.* 78 (1900): 794-808. **Hogarth.**
The exploration of Crete. By D. G. Hogarth.
On recent archæological explorations, to which the writer, in association with Mr. Evans, contributed his share in the spring of 1899.

Mediterranean—Cyprus.**Cobham.**

An attempt at a Bibliography of Cyprus. By C. D. Cobham. Fourth Edition. Nikosia, 1900. Size $8 \times 5\frac{1}{2}$, pp. 56. *Presented by the Compiler.*

Mont Blanc—Railway. *A travers le Monde, Tour du Monde* 7 (1901): 5.

Le Chemin de fer du Mont Blanc. *With Map.*

Norway—Hamar. *Norske G. Selsk. Aarb.* 11 (1899–1900): 66–96.**Kiær.**

Norde Østerdalen (En historisk-statistisk studie over befolkningsforhold og næringsliv i Nordre Østerdalens fogderi). Af A. T. Kiær. *With Map.*

On the movement of population and conditions of life on the Upper Glommen, Hamar Province.

Pyrenees.**Labrousse.**

E. Labrousse. *A travers les Pyrénées.* Paris: C. Tallandier [not dated]. Size $11\frac{1}{2} \times 8$, pp. viii. and 256. *Illustrations.* Price 6 fr.

A good general account of the range of the Pyrenees, illustrated from photographs.

Rumania.**Benger.**

Rumania in 1900. By G. Benger. Authorized Translation by A. H. Keane. London: Asher & Co., 1900. Size $11\frac{1}{2} \times 7\frac{1}{2}$, pp. xiv. and 286. *Maps, Portraits, and Illustrations.* Price 10s. net. *Presented by the Publishers.*

A useful account of the geography, resources (mineral and agricultural), trade and industry of Rumania. The book is well illustrated, but its general appearance suffers from the use of one of the modern, highly glazed papers, which, as far as the text is concerned, is to be deprecated from every point of view.

Rumania—Agriculture. *B. Statistic României* 5 (1900): 81–107.

Statistica agricolă din Anul 1900.

Rumania—Population. *B. Statistic României* 5 (1900): 108–112.

Miscarea Populațiunei României in Anul 1899.

On the movement of population in Rumania in 1899.

Rumania—Population.

Miscarea Populațiunei României in 1895. Precedată de o introduțiune cu date retrospective de Leonida Colescu. Bukharest, 1900. Size $12\frac{1}{2} \times 9$, pp. 6, xlii. and 56.

Rumania—Trade. *B.S.G. Marseille* 24 (1900): 249–258.**Levy.**

Le Commerce extérieur de la Roumanie. Par M. Victor Levy. *With Diagram.*

Rumania—Trade. *B. Statistic României* 5 (1900): 113–125.

Commerce extérieur de la Roumanie dans les Années 1890–1899.

Russia. *Zemlevedenie* 7 (1900): 105–108.**Lutzenko.**

Observations on the lakes at the source of the Don. By E. I. Lutzenko. [In Russian.]

Russia. *Zemlevedenie* 7 (1900): 95–104.**Tanflev.**

On the structure of the Lower Moscow peat-moor. By G. I. Tanflev. [In Russian.]

Russia. *Die Natur* 50 (1901): 63–65.**Rossmässler.**

Steppe und Hochgebirge in Russland. Von F. A. Rossmässler.

Russia—Amber. *Deutsche Rundschau G.* 23 (1901): 163–165.**Zweck.**

Die Bernsteingruben nördlich von Polangen. Von Dr. Alb. Zweck.

On recently discovered deposits of amber in the Baltic provinces.

Russia—Finland. *Bidrag Finlands Natur och Folk* 59 (1900): 123–171.**Sundell.**

Åskvädren i Finland 1894. Af A. F. Sundell. *With Diagram.*

On the seasonal distribution of thunderstorms in Sweden in 1894.

Russia—Finland.**Van der Vlugt.**

Pour la Finlande. Par W. Van der Vlugt. Paris, 1900. Size $7\frac{1}{2} \times 5\frac{1}{2}$, pp. 132.

Account of the recent mission of six delegates—including Baron von Nordenskiöld—to St. Petersburg to present an address to the Czar on behalf of the Finnish people, and their subsequent visit to Finland.

Russia—Novorossisk. *Ann. Hydrographie* 28 (1900): 567–570.**Herrmann.**

Noworossisk, bearbeitet durch J. Herrmann. *With Plan.*

Russian Empire.

The Russian Empire and the Trans-Siberian Railway. [From the *Summary of Commerce and Finance* for April, 1899.] Treasury Department, Bureau of Statistics. Size 12 x 9½, pp. 2503-2600. *Map*.

Switzerland—Geology. *Eclogæ Geol. Helvetiæ* 6 (1900): 497-500. **Lugeon.**

Première communication préliminaire sur la géologie de la région comprise entre le Sanetsch et la Kander (Valais-Berne). Par Maurice Lugeon.

Switzerland—Mountain Structure. *C. Rd.* 132 (1901): 45-47. **Lugeon.**

Sur la découverte d'une racine des Préalpes suisses. Note de M. Maurice Lugeon.

United Kingdom—Anglesey. *Q.J. Geol. Soc.* 57 (1901): 20-30. **Matley.**

The Geology of Mynydd-y-Garn (Anglesey). By C. A. Matley. *With Map and Section*.

United Kingdom—Channel Islands. *Nineteenth Century* 48 (1900): 881-890. **Clowes.**

The Strategical Value of the Channel Islands. By W. L. Clowes.

United Kingdom—Coal. *J. of T. Victoria I.* 32 (1900): 10-20. **Hull.**

Our Coal Reserves at the Close of the Nineteenth Century. Being the Annual Address of the Victoria Institute for 1900. By Prof. Edward Hull, LL.D., etc.

The author favours an export duty on coal as a means of husbanding the British supply.

United Kingdom—Population. *J.R. Statistical S.* 63 (1900): 527-595. **Welton.**

On the distribution of Population in England and Wales, and its Progress in the period of Ninety Years from 1801 to 1891. By Thomas A. Welton.

United Kingdom—Roman Defences. *P.R.I.* 16 (1900): 35-44. **Horsley.**

The Roman Defences of South-East Britain. By Victor Horsley.

United Kingdom—St. Kilda. **Heathcote.**

St. Kilda. By Norman Heathcote. London: Longmans & Co., 1900. Size 9 x 6, pp. xiv. and 230. *Map and Illustrations*. Price 10s. 6d. net. *Presented by the Author*.

A pleasantly written account of St. Kilda, its people, history, and prospects, with a special chapter on its bird-life, by the author of the paper published in the *Journal* for February, 1900.

United Kingdom—Wales. *Geolog. Mag.* 8 (1901): 68-69. **Greenly.**

Recent Denudation in Nant Ffrancon, North Wales. By Edward Greenly.

On the landslip of August, 1900.

United Kingdom—Yorkshire. *Geolog. Mag.* 8 (1901): 17-20. **Stather.**

The Sources and Distribution of the Far-travelled Boulders of East Yorkshire. By J. W. Stather.

ASIA.

Arabia—Muscat. *Tour du Monde* 7 (1901): 73-96. **Allemann.**

Mascate. Par Émile Allemann. *With Illustrations*.

Asia—Discovery. *Riv. G. Italiana* 7 (1900): 583-598. **Porena.**

Le scoperte geografiche del secolo XIX. del Prof. Filippo Porena. IV. Scoperte nell' Asia.

Asia—European Influence. *Contemporary Rev.* 79 (1901): 169-180. **Townsend.**

The Influence of Europe on Asia. By Meredith Townsend.

Asia—Railways. *Rev. G.* 48 (1901): 42-50, 131-137. **Barré.**

Les chemins de fer asiatiques. Par M. Paul Barré.

Central Asia. **Futterer.**

Durch Asien, Erfahrungen, Forschungen und Sammlungen während der von Amtmann Dr. Holderer unternommenen Reise. Mit Unterstützung des Grossherzoglich Badischen Ministeriums der Justiz des Kultus und Unterrichts, und des Naturwissenschaftlichen Vereins in Karlsruhe herausgegeben von Dr. K. Futterer. Band I. Geographische Charakter-Bilder. Berlin: Dietrich Reimer (Ernst Vohsen), 1901. Size 11 x 8, pp. xxvi. and 546. *Map and Illustrations*. *Presented by the Publisher*.

This important work will be specially noticed.

- Central Asia—Sea of Aral.** *Zemlevedenie* 7 (1900): 78-94. **Beri.**
 Journey to the Sea of Aral. By L. C. Beri. [In Russian.]
- Ceylon—Historical.** *J. Ceylon Br. R. Asiatic S.* 16 (1899): 15-28. **Buultjens.**
 Antiquarian Discovery relating to the Portuguese in Ceylon. *With Illustration.*
 On the discovery at Colombo of a Portuguese coat-of-arms with apparent date 1501.
- Ceylon—Historical.** *J. Ceylon Br. R. Asiatic S.* 16 (1899): 36-78. **Buultjens.**
 Governor Van Eck's Expedition against the King of Kandy, 1765. Translated from the Dutch by A. E. Buultjens. *With Map.*
- Ceylon—Survey.** **Grinlinton.**
 Ceylon. Administration Reports, 1899. Part ii. Scientific. Survey Department. Report of Mr. F. H. Grinlinton, Surveyor-General. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 30. *Maps and Illustrations. Presented by the Surveyor-General of Ceylon.*
- China.** **Madrolle.**
 Itinéraires dans l'ouest de la Chine 1895. Par Cl. Madrolle. Pour accompagner le Journal de l'auteur dans son Voyage au Yun-nan, au Tibet chinois et au Se-tch'ouen. Paris: A. Challamel, 1900. Size $10\frac{1}{2} \times 7\frac{1}{2}$. *Maps. Presented by the Author.*
 A reproduction in eighteen sheets of the route-surveys of M. Madrolle on his journey in Western China.
- China.** **Spence.**
 China. Shanghai to the Great Wall. Colonel J. Spence, D.A.G. Wednesday, July 5, 1900. (Malta Naval and Military Society.) Size 9×7 , pp. 16.
 Describes a journey carried out in 1863.
- China.** **Wolf.**
 Eugen Wolf. Meine Wanderungen. I. Im innern Chinas. Stuttgart und Leipzig: Deutsche Verlags-Anstalt, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 298. *Map and Illustrations. Price 5 m.*
 This is an account of a journey through Northern and Central China, for the study of commercial and industrial conditions, and contains much useful information.
- China—Commerce.** **Wauters.**
 Commercial China in 1899. Area, Population, Production, Railways, Telegraphs, Transportation Routes, Foreign Commerce, and Commerce of the United States with China. [From the Summary of Commerce and Finance for December, 1899.] Treasury Department, Bureau of Statistics. Size $12 \times 9\frac{1}{2}$, pp. 1581-1762. *Map. Presented by the Philadelphia Commercial Museums.*
- China—Hankow-Canton Railway.** *Mouvement G.* 17 (1900): 631-636. **Wauters.**
 Le chemin de fer Hankow-Canton. Par A. J. Wauters. *With Maps.*
- China—Railways.** *Questions Dipl. et Colon.* 11 (1901): 193-204. **Zimmermann.**
 La pénétration de la Chine méridionale. Par M. Maurice Zimmermann. *With Map.*
 On proposed railway routes to South-West China.
- China—Singan.** *National G. Mag.* 12: (1901): 63-66. **Hubbard.**
 Singan: the present Capital of the Chinese Empire. By J. M. Hubbard.
- China—Trade.** *J.R. Colonial I.* 32 (1901): 216-247. **Whitehead.**
 The Expansion of Trade with China. By T. H. Whitehead.
- China—Yunnan.** *Tour du Monde* 7 (1901): 1-72. **Vaulserre.**
 A travers le Yun-Nan et du Yun-Nan au Tonkin, par le Kouei-tchéou et le Kouang-si. Par M. le Vicomte de Vaulserre. *With Maps and Illustrations.*
 Narrative of a journey in Yunnan and Tongking in 1898, in connection with railway surveys.
- China—Yunnan.** *Rev. Maritime* 147 (1900): 241-272, 449-490. **Hubbard.**
 Le Yunnan.
 A comprehensive account of Yunnan and its recent history.
- Chinese Empire—Manchuria.** *Petermanns M.* 47 (1901): 43-47. **Bretschneider.**
 Das russische Pachtgebiet in der südlichen Mandschurei. Von Dr. E. Bretschneider.
- Chinese Empire—Tibet.** *Z. Ges. Erdk. Berlin* 35 (1900): 297-341. **Futterer.**
 Land und Leute in Nordost-Tibet. Von Prof. Dr. K. Futterer.

Chinese Empire—Tibet. *Rev. G. Italiana* 7 (1900): 565-582.

Puini.

Viaggio nel Tibet del P. Ippolito Desideri del Prof. Carlo Puini.

Notes on Desideri's journey, with abstracts from the geographical part of his manuscript.

Dutch East Indies.

Van der Chijs.

Dagh-Register gehouden int 'tasteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India, Anno 1672. Uitgegeven door het Bataviaasch Genootschap van Kunsten en Wetenschappen . . . van Mr. J. A. Van der Chijs. Batavia and the Hague: M. Nijhoff, 1899. Size 11 × 7½, pp. 390.

Eastern Asia.

Leroy-Beaulieu.

The Awakening of the East. Siberia, Japan, China. By Pierre Leroy-Beaulieu. Translated by Richard Davey. With a Preface by Henry Norman. London: W. Heinemann, 1900. Size 8 × 5½, pp. xxviii. and 300. Price 6s.

This is a thoughtful study of questions relating to Eastern and Northern Asia, with a large amount of, at the time of writing, up-to-date information.

Eastern Asia—Cyclones. *Ann. Hydrographiques* (1900): 47-161.

Algué.

Les cyclones aux Philippines et dans les mers de Chine. Étude théorique et pratique. Par le P. José Algué. With Diagrams.

French Indo-China.

Picanon.

Eugène Picanon. Le Laos Français. Paris: A. Challamel, 1901. Size 7½ × 5, pp. viii. and 364. Map. Price 3s.

A good general account of the geography, history, productions, etc., of the French sphere in the Mekong basin. The map shows the political divisions.

Himalayas—Mount Everest. *Petermanns M.* 47 (1901): 40-43.

Schlagintweit.

Der Name des höchsten Berges der Erde. Von Dr. Emil Schlagintweit.

The writer deprecates the use of a Tibetan name owing to the difficulty both of writing and pronunciation, but advocates the retention of the Indian name Gaurisankar, coupled with that of Everest.

India.

J.S. Arts 49 (1901): 290-305.

Bell.

Railways and Famine. By H. Bell.

The writer suggests that, by serving to deplete in good seasons the margin of food supply which might be available in bad seasons, the Indian railways may be a not unmixed good.

India—Afghan Frontier.

Foucher.

A. Foucher. Sur la frontière Indo-Afghane. Paris: Hachette & Cie., 1901. Size 7½ × 5, pp. viii. and 258. Map and Illustrations. Presented by the Publishers.

Account of a journey carried out in 1895-97 on the north-west frontier of India, on behalf of the French Ministry of Public Instruction, mainly for archæological research.

India—Anjediva Island. *B.S.G. Lisboa* 17 (1898-1899): 381-388.

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Memoria historica do actual estado da ilha e praça de Angediva.

India—Burma Gazetteer.

Scott and Hardiman.

Gazetteer of Upper Burma and the Shan States. In Five Volumes. Compiled by J. George Scott, assisted by J. P. Hardiman. Part i. vols. i. and ii. Rangoon, 1900. Size 10½ × 7, pp. (part i. vol. i.) 728 and x.; (part i. vol. ii.) 560, viii., and xii. Map, Plan, and Illustrations. Presented by R. F. Scott, Esq.

The first two volumes of what promises to be a valuable summary of our knowledge of Upper Burma and the districts inhabited by wild tribes to the north and east. They consist of a series of chapters dealing with a variety of subjects, from the history of the reigns of the last kings of Burma from native sources, to the geology and economic mineralogy, forestry, and agriculture of the country. The sections dealing with ethnology are particularly full and interesting, and are illustrated by photographs showing various native types.

India—Distribution of Animals. *P.R.S.* 67 (1901): 484-492.

Blanford.

The Distribution of Vertebrate Animals in India, Ceylon, and Burma. By W. T. Blanford, F.R.S. (Abstract.) [See also *Nature* 63 (1901): 287-289.]

Abridgment of a paper read at the Royal Society in December last.

India—Famines.

Nevins.

P. Lit. and Philosoph. S. Liverpool, No. 54 (1900): 145-159.

On Indian Famines. By J. Ernest Nevins.

- India—Himalayas.** *Alpine J.* 20 (1901): 305-313. **Bruce.**
 Mountaineering in the Himalayas. By Major the Hon. C. G. Bruce. *With Illustrations.*
- India—Kashmir.** **Adair.**
 The Big Game of Baltistan and Ladakh. A Summer in High Asia, being a record of Sport and Travel in Baltistan and Ladakh. By Captain F. E. T. Adair. With an Appendix on Central Asian Trade by Captain S. H. Godfrey (Late British Joint Commissioner at Leh). London: W. Thacker & Co., 1899. Size 9½ × 6, pp. xii. and 286. *Map and Illustrations.* Price 12s. 6d.
 Although the journeys here described were undertaken for purposes of sport, the book supplies some additions to our knowledge of the remote frontier districts north of Kashmir. The appendix also contains useful information.
- India—Kashmir.** *Scottish G. Mag.* 17 (1901): 74-86. **Workman.**
 Amid the Snows of Baltistan. By Fanny Bullock Workman. *With Illustrations.*
- India—Mining.** *J.S. Arts* 49 (1901): 153-177. **Evans.**
 Metalliferous Mining in India. By John W. Evans, D.Sc.
 The author devotes his attention particularly to Continental India, and omits consideration of the iron ores.
- India—Nicobar Islands.** *Indian Antiquary* 29 (1900): 341-347. **Temple.**
 An Unpublished Document about the Nicobars. By R. C. Temple.
 The document is a manuscript by Captain John Ritchie, who surveyed the Andamans and Nicobars about 1770, and made observations of much interest.
- India—North-West Frontier.** **Holdich.**
 The Indian Borderland, 1880-1900. By Colonel Sir T. Huugerford Holdich. London: Methuen & Co., 1901. Size 9 × 6, pp. xii. and 402. *Map and Illustrations.* Price 15s. net. *Presented by the Publishers.*
 This will be the subject of a special review.
- India—Sugar Canes.** *J.S. Arts* 49 (1901): 147-148. **Gill.**
 Indian Sugar Canes. By Francis N. G. Gill.
- India—Water-supply.** *J.E. India Assoc.* 33 (1901): 9-19. **Sowerby.**
 Water-supply in Mitigation of Drought in India. By William Sowerby.
- India, Burma, and Ceylon.** **Murray.**
 A Handbook for Travellers in India, Burma, and Ceylon, including the Provinces of Bengal, Bombay, and Madras, the Punjab, North-West Provinces, Rajputana, Central Provinces, Mysore, etc., the Native States, Assam, and Cashmere. Fourth Edition. London: John Murray, 1901. Size 7 × 5, pp. xc. and 484. *Maps and Plans.* Price 20s. *Presented by the Publisher.*
 Virtually a reprint of the revised and enlarged third edition issued in 1898, statistics being, however, brought up to date.
- Indian Ocean—Rainfall.** *P.R.S.* 67 (1901): 409-431. **Lockyer.**
 On Solar Changes of Temperature and Variations in Rainfall in the Region Surrounding the Indian Ocean. By Sir Norman Lockyer, K.C.B., F.R.S., and W. J. S. Lockyer, PH.D. *With Diagrams.*
- Indo-China.** *B.S.G. Lille* 35 (1901): 35-44. **Gallois.**
 Voies de communications maritimes et fluviales en Indo-Chine. Par M. Eugène Gallois.
- Japan—Commerce.**
 Commercial Japan in 1899. Area, Population, Production, Railways, Telegraphs, Transportation Routes, Foreign Commerce, and Commerce of the United States with Japan. [From the *Summary of Commerce and Finance* for July, 1899.] Treasury Department, Bureau of Statistics. Size 12 × 9½, pp. 23-158. *Map.* *Presented by the Philadelphia Commercial Museums.*
- Japan—Nagasaki.** **Longford.**
 Trade of Nagasaki for the year 1899. Foreign Office, Annual No. 2541, 1900. Size 10 × 6½, pp. 44. *Diagram.* Price 4d.
- Japan and China.** *National G. Mag.* 12 (1901): 69-77. **Webster.**
 Japan and China—some comparisons. By Commander H. Webster. *With Illustrations.*

- Korea.** *Mission Field* 46 (1901): 44-53. **Hillary.**
 A Journey to the North of Corea. By the Rev. F. Hillary. *With Illustrations.*
 The journey was made early in 1900.
- Malay Archipelago—Borneo.** **Engelhard.**
Bijdr. Taal-, Land- en Volkenk. Ned.-Indië 8 (1901): 179-222.
 De afdeeling Doessonlanden. (Zuider- en Ooster-afdeeling van Borneo.) Door H. E. D. Engelhard. *With Map.*
 This division occupies the upper basin of the Barito.
- Malay Archipelago—Java.** **Kern.**
Bijdr. Taal-, Land- en Volkenk. Ned.-Indië 8 (1901): 381-392.
 Een Javaansch sprekende bevolking in de Preanger-Regentschappen. Door R. A. Kern.
- Malay Archipelago—Java.** **Van den Berg.**
Bijdr. Taal-, Land- en Volkenk. Ned.-Indië 8 (1901): 1-140.
 Het inlandsche Gemeentewezen op Java en Madoera. Door Prof. L. W. C. van den Berg.
 On the village system of the native population of Java and Madura.
- Malay Archipelago—Sumatra.** **Pleyte.**
Globus, 79 (1901): 1-7, 24-32.
 Die Mentawai-Inseln und ihre Bewohner. Von C. M. Pleyte. *With Map and Illustrations.*
- Persian Gulf.** *Questions Dipl. et Colon.* 11 (1901): 129-146. **d'Avril.**
 Le Golfe Persique, route de l'Inde et de la Chine. Par le Baron A. d'Avril. *With Map.*
- Russia—Batum.** *Ann. Hydrographie* 28 (1900): 571-574. **Herrmann.**
 Batum, bearbeitet durch J. Herrmann.
- Russia—Siberia.** **Ditmar.**
 Reisen und Aufenthalt in Kamtschatka in den Jahren 1851-1855. Von Karl von Ditmar. Zweiter Theil. Allgemeines über Kamtschatka. Erste Abtheilung. (Beiträge zur Kenntniss des Russischen Reiches und der Angrenzenden Länder Asiens, Dritte Folge. Herausgegeben von L. v. Schrenck und C. J. Maximowicz, beendet von F. Schmidt. Band viii.) St. Petersburg, 1900. Size 10 × 7, pp. viii. and 276.
 General pictures of the country and people of Kamchatka, supplementing the account of the journey published in the same series in 1890. The delay in issuing the present instalment is due to the author's death in 1892.
- Russia—Siberia.** **Slionine.**
 Okhotsko-Kamtchatsky Kraij: Estestvennoistoricheskoe Opisanie. [The Okhotsk-Kamchatkan Region: A Natural-Historical Description.] By Dr. H. V. Slionine. 2 vols. (Vol. ii. Appendices.) St. Petersburg, 1900. Size 10 × 7, pp. (vol. i.) x. and 690; (vol. ii.) 166. *Map and Illustrations. Presented by the Author.*
 An important work by a member of the Bogdanovich expedition of 1895-98. Dr. Slionine was attached to the mission by the Russian Ministry of Finance for the purpose of studying the economic geography and ethnology of the region bordering the sea of Okhotsk, but he also paid attention to its general geography, of which he gives a detailed account in this work. The book is excellently illustrated, and has large-scale map.
- Russian Central Asia.** *B.S.G. Marseille* 24 (1900): 337-342. **Gourdet.**
 Lettres de l'Asie Centrale. Par M. Paul Gourdet.
 On recent events in the Vyernye district.
- Turkey.** **Sykes.**
 Through Five Turkish Provinces. By Mark Sykes. London: Bickers & Son, 1900. Size 9½ × 6, pp. viii. and 150. *Map and Illustrations. Price 7s. 6d.*
 The account of a journey through Asiatic Turkey in 1899.
- Turkey—Asia Minor.** *Globus* 78 (1900): 350-357. **Vincenz.**
 Ein Ausflug zu den Teppichknüpfern in Kula. Von Friedrich v. Vincenz. *Illustr.*
 An account of the Kula carpet factories.
- Turkey—Bagdad.** **Le Strange.**
 Baghdad during the Abbasid Caliphate from contemporary Arabic and Persian Sources. By G. Le Strange. Oxford: the Clarendon Press, 1900. Size 9 × 6,

pp. xxxii. and 382. *Map and Plans.* Price 16s. nett. Presented by the Clarendon Press.

An exhaustive account of the city of Baghdad and its mediæval plan, as deduced from the description written by Ibn Serapion in about 900 A.D., of which the British Museum possesses a unique copy. The plans show various portions of the city at different periods.

AFRICA.

Abyssinia. *National G. Mag.* 12 (1901): 89-102. Crosby.

Abyssinia—the Country and People. By Oscar T. Crosby.

Describes a visit to Abyssinia in 1900.

Abyssinia. *J. Anthropol.* 1. 30 (1900): 50-55. Koettlitz.

Notes on the Galla of Walega and the Bertat. By Reginald Koettlitz, M.D. With Illustrations.

Abyssinia. *Questions Dipl. et Colon.* 11 (1901): 205-212. Michel.

L'Éthiopie: les intérêts anglais et français. Par M. Charles Michel. With Map.

Abyssinia. Wylde.

Modern Abyssinia. By Augustus B. Wylde. London: Methuen & Co., 1901. Size 9 × 6, pp. 506. *Frontispiece and Map.* Price 15s. net. Presented by the Publishers.

This will be noticed with other books on Africa.

Abyssinia. *B. Comité l'Afrique Française* 11 (1901): 72-78. ———

La question d'Éthiopie.

On the question of the future of Abyssinia.

Abyssinia. Vivian.

Abyssinia. Through the Lion-Land to the Court of the Lion of Judah. By Herbert Vivian, M.A. London: C. Arthur Pearson, Ltd., 1901. Size 9 × 6, pp. xvi. and 342. *Maps and Illustrations.* Price 15s. Presented by the Publisher.

This will be noticed together with other African books.

Abyssinia and Sudan. Michel.

Mission de Bonchamps. Vers Fachoda à la rencontre de la Mission Marchand à travers l'Éthiopie. Par Charles Michel. Paris: Plon-Nourrit & C^e, 1901. Size 9 × 6, pp. 560. *Map and Illustrations.* Price 7s. 6d.

An important work which will be specially noticed.

Africa—Climatology. *Brit. Assoc. Rep.* (1900): 413-420. Ravenstein.

The Climatology of Africa.—Ninth Report of a Committee. (Drawn up by the Chairman, Mr. E. G. Ravenstein.)

African Civilization. *Ann. Rep. Smithsonian I.* (1898): 637-650. Frobenius.

The Origin of African Civilizations. By L. Frobenius. With Maps.

Translation of the article which appeared in the *Zeitschrift* of the Berlin Geographical Society in 1898.

British East Africa—Uganda. Lugard.

The Story of the Uganda Protectorate. By General F. D. Lugard. (The Story of the Empire Series.) London: H. Marshall & Son [not dated]. Size 7 × 4½, pp. 176. Price 1s. 6d. Presented by the Publishers.

An excellent summary of the history of Uganda and the establishment of British rule in the country, by one whose share in the work accomplished is second to none. The natives and their manners and customs are fully described. The author considers the great drawback to progress has hitherto been the lack of continuity of administration.

British West Africa. Wallach.

Wallach's West African Manual: with a Map. Compiled by Henry Wallach. Second Edition. Enlarged. London: F. C. Mathieson & Sons, 1900. Size 7½ × 3½, pp. xxxvi. and 72. Price 2s. 6d. net.

The bulk of this manual is taken up with statistics relating to mining companies on the Gold Coast.

Central Africa. *Mouvement G.* 18 (1901): 13-16. ———

Dans le sud du Katanga. With Map.

Based on Mr. Chesnaye's narrative (*ante*, p. 42). The map is filled in from the

work of other travellers, but does not take account of Mr. Codrington's map in the *Journal* for March, 1900.

Congo.

Société d'Études Coloniales. Manuel du Voyageur et du Résident au Congo rédigé sous la direction du Général Donny. 3 vols. and Supplement. Bruxelles, 1900-1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. (i.) 336; (ii.) 224; (iii.) 260 (Supplement.—*L'Art Militaire au Congo*, 1897), 168. Map [in 4 sheets in separate Cover] and Illustrations. Presented by the Société d'Études Coloniales.

A most useful handbook, supplying a large amount of practical information in a handy form. Although primarily intended for travellers and residents in the Congo State, it will be of use to all visitors to and settlers in tropical countries. The subjects dealt with are very various, including, in addition to those ordinarily treated of in hints to travellers (outfit, surveys, medicine and hygiene, photography, collections, etc.), such others as the construction of houses, cultivation, and stock-raising. The map is the fourth edition of Prof. Du Fief's map of the Congo State, and shows (with a few exceptions) the routes of all travellers down to June, 1900.

Egypt.

Fuller.

Egypt and the Hinterland. By F. W. Fuller. London: Longmans & Co., 1901. Size 9×6 , pp. xvi. and 334. Map and Frontispiece. Price 10s. 6d. net. Presented by the Publishers.

This will be noticed with other African books.

Egypt.

Globus 79 (1901): 105-108.

Unter den Fellachen Gosen. Von R. T. K. With Illustrations.

Egypt.

Geolog. Mag. 8 (1901): 23-28.

Beadnell.

On some Recent Geological Discoveries in the Nile Valley and Libyan Desert. By Hugh J. L. Beadnell. Also separate copy, presented by the Author.

A note appears on this paper (*ante*, p. 527).

Egypt—Climate.

J. of T. Victoria I. 32 (1900): 87-105.

Grant Bey.

The Climate of Egypt in Geological, Prehistoric, and Ancient Historic Times. By Dr. Grant Bey.

Egypt—Libyan Desert.

B.S. Khediv. G. 5 S. (1900): 429-475.

Moritz.

Excursion aux oasis du désert libyque. Par Dr. B. Moritz. With Illustrations.

On a visit to the oases of Kharjah and Dakhilah early in 1900.

Egypt—Libyan Desert.

B.S. Khediv. G. 5 S. (1900): 477-478.

Paoletti.

Route de Ghirgheh à Khargheh. Par H. Paoletti. With Map.

Egypt—Nile Valley.

Petermanns M. 47 (1901): 1-10.

Schweinfurth.

Am westlichen Rande des Nilthals zwischen Farschût und Kom Ombo. Von Prof. Dr. G. Schweinfurth. With Map.

A valuable contribution to our knowledge of the physical features of a part of the Nile valley, especial attention being given to geology and botany.

Egypt—Suez Canal.

Girard.

B.S.G. Com. Bordeaux 26 (1900): 278, 329, 361, 394, 409, 429; 27 (1901): 9.

Le Canal maritime de Suez. Par M. B. Girard.

French Congo.

Questions Dipl. et Colon. 11 (1901): 213-219.

Bourdarie.

Le Congo Français et la Colonisation. Par M. Paul Bourdarie.

The writer discusses the probable results of recent colonial undertakings.

French Congo.

La G., B.S.G. Paris 3 (1901): 181-192.

Jobit.

Mission Gendron au Congo français. Explorations de la brigade Jobit. Par E. Jobit. With Map.

French Congo.

La G., B.S.G. Paris 3 (1901): 193-196.

Lœfler.

Mission Gendron au Congo français. Note sur la région comprise entre le N'Gounié et l'Alima. Par Ch. Lœfler.

French Congo.

Mouvement G. 18 (1901): 85-91.

Wauters.

Le problème du Wam. Par A. J. Wauters. With Maps.

M. Wauters thinks that the Wam is to be identified with the Vulu-Vuli, a tributary of the Gribingi, and not with the Bahr Sara (*cf. ante*, p. 306).

French Congo.

B. Comité l'Afrique Française 11 (1901): 44-46.

La question du Wame. With Map.

This was referred to in the *Journal* for March (*ante*, p. 305).

French Somaliland.**Heudebert.**

Lucien Heudebert. *Au Pays des Somalis et des Comoriens.* Paris: J. Maisonneuve, 1901. Size 9 × 6, pp. 282. *Illustrations.* Price 5s. 8d.

This work gives a detailed account of the French Somali Coast Protectorate, its people, resources, trade, etc., as the result of a visit to the country. The section dealing with the Comoro islands, though containing some useful information, is much more brief.

French West Africa.

Renseignements Colon., Comité l'Afrique Française, No. 2 (1901): 25-32.

Le pays Zaberma. *With Map.*

Geographical and historical notes on the country between the Niger and the Dallol Mauri.

French West Africa—Chad Districts.**Reibell.**

Renseignements Colon., Comité l'Afrique Française, No. 1 (1901): 15-23.

La campagne contre Rabah. Rapport du Commandant Reibell.

French West Africa—Ivory Coast.**Nebout.**

A travers le Monde 6 (1900): 393-396, 401-404, 409-412; 7 (1901): 17-20, 35-36.

Notes sur le Baoulé. Par M. A. Nebout. *With Illustrations.*

German East Africa. M. Deutsch. Schutzgeb. 13 (1900): 344-346.**Herrmann.**

Bericht über Land und Leute längs der deutsch-englischen Grenze zwischen Nyassa und Tanganyika. Von Hauptmann Herrmann.

German East Africa. M. Deutsch. Schutzgeb. 13 (1900): 265-343.**Kohlschütter.**

Bericht über die astronomischen und geodätischen Arbeiten der deutschen Grenzregulierungs-Kommission zwischen dem Nyassa- und Tanganyika-See. Von Dr. E. Kohlschütter. *With Map (in four sheets) and Diagram.*

See note, *ante*, p. 429.

German East Africa. Globus 79 (1901): 53-55, 76-78, 92-94.**Leue.**

Uha (Deutsch-Ostafrika). Von A. Leue.

German East Africa. M. Deutsch. Schutzgeb. 13 (1900): 346-347.

Begleitworte zu Karte 4: Aufnahmen des Hauptmanns v. Prittwitz und Gaffron in den Ut-hungwe-Bergen (Uhéhe) 1897 und 1898. *Map.*

German South-West Africa—Railway.**Gerding.**

Deutsche Kolonialzeitung 17 (1900): 567-569, 586-589.

Die Bahn Swakopmund-Windhuk. Von Oberstleutnant Gerding.

Gold Coast—Kumassi.**Hodgson.**

The Siege of Kumassi. By Lady Hodgson. London: C. Arthur Pearson, Ltd., 1901. Size 9 × 6, pp. 366. *Map, Plan, and Illustrations.* Price 21s. *Presented by the Publisher.*

A brightly written account of the thrilling events connected with the Ashanti troubles of 1900, with a few notes on questions affecting the future of the Gold Coast.

Madagascar. Globus 79 (1901): 55-63.**Seidel.**

Neue Forschungen und Fortschritte auf Madagaskar. Von H. Seidel. *With Illustrations.*

Madagascar, etc.**Keller.**

Madagascar, Mauritius, and the other East-African Islands. By Prof. Dr. C. Keller. London: Sonnenschein & Co., 1901. Size 9½ × 6½, pp. xiv. and 242. *Maps and Illustrations.* Price 7s. 6d.

A translation of the German work belonging to the same series as Fricker's 'Antarctic Regions.' It forms the best summary of our knowledge of the East African islands down to 1898.

Natal—Mining Industry.**Gray.**

Report on the Mining Industry of Natal for the year 1899. By C. J. Gray. Pietermaritzburg, 1900. Size 13½ × 8½, pp. 70.

North-East Africa. B.G.S. Philadelphia 2 (1900): 115-138.**Smith.**

An Expedition between Lake Rudolf and the Nile. By Dr. A. Donaldson Smith. *With Map.*

Portuguese East Africa. C. Rd. 131 (1900): 1258-1260.**Choffat.**

Sur le Crétacique supérieur, à Moçambique. Note de M. Paul Choffat.

- Portuguese East Africa.** *Questions Dipl. et Colon.* 11 (1901): 83-103. **Hause.**
 Etudes sur les Colonies portugaises.—III. Moçambique. Par le prof. Henri Hauser.
- Sahara—Adrar.** *A travers le Monde, Tour du Monde* 6 (1900): 389. **Blanchet.**
 La Mission saharienne Blanchet. *With Portrait and Map.*
- Sahara—Tuat.** *A travers le Monde, Tour du Monde* 7 (1901): 37-39. ———
 Le Touat et le chemin de fer d'Igli. *With Map.*
- South Africa.** *Scottish G. Mag.* 17 (1901): 57-74. [Corstorphine.]
 A Former Ice Age in South Africa.
 Based on the work of Messrs. Rogers and Schwartz (cf. *ante*, p. 211).
- West Africa.** **Schlechter.**
 Westafrikanische Kautschuk-Expedition. (R. Schlechter.) 1899-1900. Berlin: Verlag des Kolonial-Wirtschaftlichen Komitees, 1900. Size 10 × 7, pp. viii. and 326. *Illustrations.* Price 12 m. *Presented by the Kolonial-Wirtschaftliches Komitee.*
 This will be noticed with other books on Africa.
- West African Coasts.** *J. of T. Victoria I.* 32 (1900): 147-164. **Hull.**
 The Sub-Oceanic River Valleys of the West African Continent and of the Mediterranean Basin. By Prof. Edward Hull, LL.D., etc. *With Map.*
 It is difficult to understand the writer's statement that the depth of the Congo opposite Banana creek only reaches 9 fathoms, and that the head of the sub-oceanic valley begins 5 miles to the west; the fact being that the deep cañon, with soundings reaching 124 fathoms, extends at least 11 nautical miles above the creek.
- NORTH AMERICA.**
- Alaska—Boundary Question.** *Scottish G. Mag.* 17 (1901): 30-40, 86-96. **Begg.**
 Review of the Alaska Boundary Question. By Alexander Begg.
- America—Hurricane.** *Globus* 79 (1901): 32-33. **Greim.**
 Der westindische Hurrikan vom 1. bis 12. September 1900, von — Greim. *Map.*
- Canada—Geological Survey—Index.** **Dowling.**
 Geological Survey of Canada. General Index to the Reports of Progress, 1863 to 1884. Compiled by D. B. Dowling. Ottawa, 1900. Size 10 × 6½, pp. 476. *Presented by the Geological Survey of Canada.*
 A most useful index, giving references under subjects as well as authors.
- Canada—Gulf of St. Lawrence.** *Nature* 63 (1901): 311-313. ———
 The Currents in the Gulf of St. Lawrence.
 Draws attention to points emphasized by the recent investigations, referred to in the *Journal* for December (vol. xvi. p. 685).
- Canada—Historical.** **Bourinot.**
 Canada under British Rule 1760-1900. By Sir John G. Bourinot. Cambridge: The University Press, 1900. Size 8 × 5½, pp. xii. and 346. *Maps.* Price 6s. *Presented by the Cambridge University Press.*
 The appearance of this work is particularly welcome at a time when so much attention is directed to the great self-governing colonies of Great Britain. It supplies in a convenient form a review of "the political, economic, and social progress of the provinces of Canada under British rule," with chapters on the early French history, and the relations with the United States. In the latter the various past and present boundary questions are discussed and illustrated by maps. An appendix draws a comparison between the constitutions of the Dominion of Canada and the Commonwealth of Australia.
- Canada—Huron Race.** *T. Ottawa Lit. and Sci. S.*, No. 2 (1899-1900): 69-92. **Gérin.**
 The Hurons of Lorette. By Léon Gérin. *With Map.*
 On the social conditions, traditions, etc., of the Huron settlement at Lorette, near Quebec.
- Canada—Islands.** *T. Ottawa Lit. and Sci. S.*, No. 2 (1899-1900): 9-68. **Johnson.**
 Canada's Northern Fringe. By George Johnson.
 On the northern islands constituted the District of Franklin by an Order-in-Council of 1895.

Canada—Moose River Basin.**Parks.**

The Huronian of the Moose River Basin. By W. A. Parks. (University of Toronto Studies, Geological Series, No. 1.) The University Library: Published by the Librarian, 1900. Size $10\frac{1}{2} \times 7$, pp. 36. *Sketch-map.*

Canada—Rocky Mountains.**Leprince-Ringuet.**

Ann. Club Alpin Français 26 (1899): 249-269.

A travers le Canada, seconde ascension du Sir Donald. Par M. Leprince-Ringuet. *With Illustrations.*

Mexico. B. Observatorio Astronóm. Nac. Tacubaya 2 (1900): 187-216. Covarrubias.

Determinación de la posición geográfica de México. Por F. Diaz Covarrubias.

Mexico—Climate.**Moreno y Anda and Gomez.**

El clima de la República Mexicana en el año de 1896. Por M. Moreno y Anda y Antonio Gomez. Año II. México, 1900. Size 7×5 , pp. 180. *Map and Diagram.*

Mexico—Lower California. B. American G.S. 32 (1900): 397-429.**Eisen.**

Explorations in the Central Part of Baja California. By Gustav Eisen, PH.D. *With Map.*

Mexico—National Observatory.

B. Observatorio Astronóm. Nac. Tacubaya 2 (1900): 217-262.

Longitud del Observatorio Astronómico Nacional Mexicano por señales telegráficas cambiadas directamente entre St. Louis Missouri (E. U. de A.) y Tacubaya. *With Plate.*

Mexico—Tacubaya.**Moreno y Anda.**

B. Observatorio Astronóm. Nac. Tacubaya 2 (1900): 183-186.

La variación diurna de la declinación magnética en Tacubaya en relación con el periodo de las manchas solares. Por M. Moreno y Anda.

Mexico—Vera Cruz.**Chapman.**

Trade of Vera Cruz for the years 1898-99 and part of 1900. Foreign Office, Annual, No. 2539, 1900. Size $9\frac{1}{2} \times 6$, pp. 26. *Price 2d.*

Contains some particulars on means of communication in Mexico. The improvement of that over the isthmus of Tehuantepec will, it is said, revolutionize the foreign trade of Mexico.

Rocky Mountains—Flora. Science 12 (1900): 870-873.**Rydberg.**

Plant Geography of North America. Composition of the Rocky Mountain Flora. By Dr. P. A. Rydberg.

United States.

B. American Bureau G. 1 (1900): 365-381.

Phelps.

The Heart of our North-western Empire. By William F. Phelps. *Illustrations.*

This paper traces the influence of natural conditions on the history of the region of which Duluth is the centre.

United States—Agriculture. J.R. Statistical S. 63 (1900): 648-657.**Hooker.**

Farm Prices of Wheat and Maize in America, 1870-99. By R. H. Hooker, M.A. *With Diagrams.*

The diagrams illustrate the gradual approximation of prices in this country to those on the farm in the United States.

United States—California. Sierra Club B. 3 (1900): 150-158.**Kellogg.**

King's River Cañon Trail Notes. By V. L. Kellogg.

On the routes to the cañon on the south fork of King's river.

United States—California. National G. Mag. 12 (1901): 108-114.**McAdie.**

The Sea Fogs of San Francisco. *With Illustrations.*

United States—California. Sierra Club B. 3 (1900): 119-126.**Muir.**

Lake Tahoe in Winter. By John Muir.

United States—Geodesy.**Schott.**

Treasury Department. U.S. Coast and Geodetic Survey. Geodesy. The Transcontinental Triangulation and the American Arc of the Parallel. By Assistant Chas. A. Schott. Special Publication. No. 4. Washington, 1900. Size $12 \times 9\frac{1}{2}$, pp. 872. *Maps, Diagrams, and Illustrations. Presented by the U.S. Coast and Geodetic Survey.*

This gives a complete statement of the methods and results of the operations of the American Transcontinental Triangulation. In the concluding section a preliminary combination of the various American arcs yet measured is put forward, the result

showing, firstly, a striking agreement between the several results; and, secondly, that the five arcs within the United States, when combined with the Peruvian arc or among themselves, all demand a representative spheroid of somewhat larger dimensions than that of Bessel.

United States—Iron and Steel Trade.

Internal Commerce. The Iron and Steel Trade of the United States. Its resources, development, and relations to the Home and the World Markets. [From the Summary of Commerce and Finance for August, 1900.] Treasury Department, Bureau of Statistics. Size $11\frac{1}{2} \times 9\frac{1}{2}$, pp. 199–280. *Map and Diagrams.*

United States—Maryland.

Abbe.

B. American Bureau G. 1 (1900): 151–157, 242–248, 342–355.

The Physiographic Features of Maryland. By Cleveland Abbe, Jr. *With Map and Illustration.*

United States—Massachusetts.

Crosby.

Geology of the Boston Basin. By William O. Crosby. Vol. i. Part iii.—The Blue Hills Complex. (Occasional Papers of the Boston Society of Natural History. IV.) Boston, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 289–694. *Maps and Plates. Presented by the Boston Society of Natural History.*

United States—Massachusetts. *Nature* 63 (1900): 192–193.

[Haddon.]

A Pre-Columbian Scandinavian Colony in Massachusetts. By A. C. H. *With Illustrations.*

On observations by Mr. Gerard Fouke in the *American Anthropologist*.

United States—Meteorology.

Tables of Daily Precipitation at Special River and Rainfall Stations of the United States Weather Bureau for the years 1893, 1894, 1895. (U.S. Department of Agriculture, Weather Bureau.) Washington, 1900. Size $10 \times 6\frac{1}{2}$, pp. 256. *Presented by the U.S. Department of Agriculture, Weather Bureau.*

United States—Pennsylvania.

MacElwee.

P.A. Nat. Sci. Philadelphia (1900): 482–484.

The Flora of the Edgehill Ridge near Willow Grove and its Ecology. By A. MacElwee.

United States—Pennsylvania. *P.A. Nat. Sci. Philadelphia* (1900): 160–338. Rand.

Notes on the Geology of South-eastern Pennsylvania. By T. D. Rand. *With Map and Illustrations.*

United States—Population. *Globus* 79 (1901): 78–80.

Zimmermann.

Wie wird sich die Bevölkerung der Vereinigten Staaten von Nordamerika im 20 Jahrhundert und darüber hinaus vermehren? Von Dr. R. Zimmermann.

United States—Rocky Mountains.

Davis.

P. American A. Arts and Sci. 35 (1900): 345–373.

The Freshwater Tertiary Formations of the Rocky Mountain Region. By W. M. Davis.

United States—Texas.

G.Z. 7 (1901): 42–49.

Deckert.

Galveston und seine Sturmflut. Von Dr. Emil Deckert. *With Map.*

CENTRAL AND SOUTH AMERICA.

Andes.

P.R.I. 16 (1900): 189–192.

Conway.

Climbs and Explorations in the Andes. By Sir W. M. Conway. [Abstract.]

Argentine Republic.

Memoria del Departamento del Interior correspondiente al año 1899. 2 vols. Buenos Aires, 1900. Size $10\frac{1}{2} \times 7$, pp. (vol. i.) 292; (vol. ii.) viii. and 850. *Plan. Presented by Dr. F. P. Moreno.*

These reports contain a large amount of useful statistical information, both on the republic as a whole and on the separate territories. The decrees creating the new "Territorio de los Andes," and dividing it into three departments, are reproduced.

Argentine Republic.

Daireaux.

Exposé du progrès de la géographie économique de la République Argentine au XIX^e siècle. Par M. Émile Daireaux. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à No. V.—MAY, 1901.)

l'étude. 4^e section—Question II.) Paris: Société de Géographie Commerciale. Size 11 × 7, pp. 20.

Argentine Republic. *An. S. Ci. Argentina* 50 (1900): 166-171. **Furque.**

Las ruinas de Londres de Quinmivil (Catamarca). Por Hilarión Furque. *Plan.*

On ruins of a fortified town, probably Spanish, and dating from the 16th century.

Argentine Republic—Bermejo Expedition. **Dobson.**

A short account of the Leach Bermejo Expedition of 1899, with some reference to the Flora, Fauna, and Indian tribes of the Chaco. By A. A. G. Dobson. Buenos Aires: J. Smart, 1900. Size 7 × 5, pp. 74. *Illustr. Presented by the Author.*

An interesting short narrative of the expedition described in the *Journal* for June last (vol. xv. p. 599). Incidentally the writer gives useful notes on the resources and prospects of the regions traversed.

Bolivia—Andes. *B.S.G. La Paz* 2 (1900): 83-85. **Ballesteros.**

Apuntaciones para el mapa publicado por Sir Martin Conway en el Boletín de la Real Sociedad Geográfica de Londres. (Cordillera Real de Bolivia.)

On some points of nomenclature suggested by Sir M. Conway's map.

Bolivia—Santa Cruz. *B.S.G. La Paz* 2 (1900): 93-115. **Guardia.**

Datos para la Monografía del Departamento de Santa Cruz. Por F. Guardia.

Brazil. *Scottish G. Mag.* 17 (1901): 11-30. **Koettlitz.**

From Para to Manaos: a trip up the Lower Amazon. By Reginald Koettlitz. *With Illustrations.*

Brazil and Argentine Republic. **Rancourt.**

Étienne de Rancourt. Fazendas et Estancias. Notes de voyage sur le Brésil et la République Argentine. Paris: Plon-Nourrit & Cie., 1901. Size 7½ × 5, pp. 288. *Map and Illustrations. Price 3s.*

This work contains some useful information on the agricultural resources of portions of Southern Brazil and the Argentine, and especially on the coffee production of the state of São Paulo.

Brazil—Topaz. *American J. Sci.* 11 (1901): 25-34. **Derby.**

On the mode of occurrence of Topaz near Ouro Preto, Brazil. By Orville A. Derby. *With Illustrations.*

Central America. *Verh. Ges. Erdk. Berlin* 27 (1900): 417-426. **Sapper.**

Dr. Carl Sapper: Ergebnisse seiner Reisen in Mittel-Amerika. *With Map.*

An abstract of this paper is given at p. 432, *ante*.

Central America. *Petermanns M.* 47 (1901): 25-40. **Sapper.**

Beiträge zur Ethnographie des südlichen Mittelamerika. Von Dr. Carl Sapper. *With Map.*

Central America—Lake Nicaragua. *B.G.S. Philadelphia* 3 (1901): 1-20. **Heilprin.**

The Shrinkage of Lake Nicaragua.

The Water Supply of Lake Nicaragua. By Angelo Heilprin.

Prof. Heilprin here brings forward more evidence in support of his view that the level of Lake Nicaragua has fallen steadily during the last fifty years (*cf. Journal*, vol. xv. p. 648), and replies to criticisms by the hydrographer of the Canal Commission.

Chile. *Petermanns M.* 47 (1901): 11-18. **Martin.**

Llanquihue und Chiloe, Südchile. Von Dr. C. Martin. *With Map.*

Dutch Guiana. *Tijds. K. Ned. Aard. Genoots. Amsterdam* 18 (1901): 80-88. **Cappelle.**

De expeditie van Cappelle naar Suriname's Binnenland.

On an expedition made last year to the upper Nikeri river.

French Guiana. *A travers le Monde, Tour du Monde* 7 (1901): 25-28. **Montelavel.**

De Cayenne à l'Oyapock. Par M. Roland Montelavel. *With Illustrations.*

On a journey by F. Geay in 1897-98.

French Guiana and Brazil. *Ann. G.* 10 (1901): 68-70. **Vidal de la Blache.**

Le contesté franco-brésilien. Par P. Vidal de la Blache. *With Map.*

French and Brazilian Guiana. *Questions Dipl. et Colon.* 11 (1901): 31-37. **Bernard.**

Le Contesté franco-brésilien. Par M. A. Bernard. *With Map.*

French and Brazilian Guiana. *Rev. Française* 26 (1901): 70-76. **Vasco.**

L'arbitrage du contesté Franco-Brésilien. Par M. G. Vasco.

Guatemala.**Maudslay.**

Biologia Centrali-Americana. Edited by F. Ducane Godman. Archæology. By A. P. Maudslay. Part xiv. (Text and Plates), February, 1901. London: R. H. Porter. Size (Text) $13\frac{1}{2} \times 10\frac{1}{2}$, (Plates) $13\frac{1}{2} \times 20\frac{1}{2}$.

Patagonia.*B.G.S. Philadelphia* 2 (1900): 139-145.**Hatcher.**

The Lake Systems of Southern Patagonia. By J. B. Hatcher. *With Map.*

Patagonia.*Globus* 78 (1900): 333-338, 357-360.**Hauthal.**

Die Haustiereigenschaft des *Grypotherium domesticum* Roth, die Glacialverhältnisse bei Ultima Esperanza und die Berechtigung des Namens *Grypotherium domesticum*. Von Prof. R. Hauthal. *With Map and Illustration.*

The writer insists that the cave in which the remains of a *Mylodon*-like animal were discovered in 1898, was inhabited during the inter-glacial period.

Patagonia.**De la Vaulx.**

Comte Henry De la Vaulx. *Voyage en Patagonie.* Paris: Hachette & Cie., 1901.

Size $7\frac{1}{2} \times 5$, pp. xvi. and 284. *Map and Illustrations.* Price 3s.

Account of a journey made in 1896-97 with the support of the French Ministry of Public Instruction. The author traversed the whole of Patagonia from north to south, in great part along the eastern foot of the Andes.

Patagonia.**Gribaundi.**

Prof. Pietro Gribaundi. Il progetto di colonizzazione Italiana della Patagonia.

(Estratto dalla *Rivista Geografica Italiana*, Anno iv. Fasc. vi.-vii., 1900.)

Firenze, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 16. *Presented by the Author.*

On a scheme drawn up in 1899 by General R. Garibaldi, according to which the concession of a vast area in the governments of the Rio Negro, Neuquen, Chubut, Santa Cruz, and Tierra del Fuego would be purchased from the Argentine Government with a view to colonization by Italians.

Peru.**[Gepp.]**

Geographical and Statistical Synopsis of Peru, 1895 to 1898. New Edition.

Lima, 1899. Size $10\frac{1}{2} \times 7\frac{1}{2}$, pp. 32.

Peru—Chimu.*Norske G. Selsk. Aarb.* 11 (1899-1900): 1-16.**Nielsen.**

Chimúfolket og dets gamle Kultur af prof. dr. Yngvar Nielsen. *With Illustrations.*

On the builders of the ancient city of Chimu, in the province of Trujillo.

Peru—Railway.*B.S.G. Com. Bordeaux* 26 (1900): 449-453.**Molinié.**

Le chemin de fer transandin du Pérou. Par M. H. Molinié.

Description of the railway from Callao to Oroya.

Porto Rico—Census.

Report on the Census of Porto Rico, 1899. Washington, 1900. Size $9\frac{1}{2} \times 6$,

pp. 418. *Maps and Plates.* *Presented by the U.S. War Department.*

The main results of the census, as summarized by Mr. H. Gannett, are referred to at p. 432, *ante*.

Porto Rico—El Yunque.*Sierra Club B.* 3 (1900): 127-134.**McClure.**

Ascent of "El Yunque." By N. F. McClure.

South America.*Jahresb. G. Ges. München* (1898-1899): 8-36.**Speidel.**

Bericht über die Reise I. K. H. Prinzessin Therese von Bayern nach Südamerika im Jahre 1898 erstattet von Albert Frhrn von Speidel. *With Plates.*

South America.*Jahresb. G. Ges. München* (1898-1899): 1-7.**Therese.**

Zwecke und Ergebnisse meiner im Jahre 1898 nach Südamerika unternommenen Reise. Von Therese, Prinzessin von Bayern.

The principal objects of the princess's journey were the study of the distribution of the flora, and the animal life, of the lowlands of Colombia and Ecuador, and of the Andes and their plateau lands.

Trinidad—Cane-farming.*West Indian B.* 2 (1901): 33-41.**Carmody.**

Cane-farming in Trinidad. By Prof. P. Carmody.

AUSTRALASIA AND PACIFIC ISLANDS.**Australia—Flora.***J. of T. Victoria I.* 32 (1900): 106-146.**Woolls.**

Remarks on the Past, Present, and Future of the Australian Flora. By the Rev.

W. Woolls, PH.D.

- Australia—Glacial Epochs.** *Z. Ges. Erdk. Berlin* 35 (1900): 239-286. **Penck.**
 Die Eiszeiten Australiens. Von Prof. Dr. Albrecht Penck. *With Map.*
 See note, *ante*, p. 308.
- Australia—Railways.** *Deutsche Rundschau G.* 23 (1901): 212-218. **Jung.**
 Die Eisenbahnen des Australcontinents. Von Dr. Emil Jung. *With Map.*
- German New Guinea.** *Globus* 79 (1901): 101-105. **Erdweg.**
 Ein Besuch bei den Varópu (Deutsch-Neu-Guinea). Von P. J. Erdweg.
 The Varópu are a little-known tribe in the west of German New Guinea, and the writer is a missionary settled at Berlinhafen, near their district.
- German New Guinea.** *Ann. Hydrographie* 29 (1901): 8-16. **Schack and Hering.**
 Zur Küstenkunde des Bismarck-Archipels. *With Charts.*
 Gives the native names of seventeen islands of the Admiralty group.
- Kerguelen Island.** *T.R.S. South Australia* 24 (1900): 104-108. **Tate.**
 On the Occurrence of Marine Fossiliferous Rocks at Kerguelen Island. By Prof. Ralph Tate. *With Plates.*
 Gives the results of observations by Mr. Robert Hall, of Melbourne, during a visit to Kerguelen in 1898.
- Marshall and Caroline Islands.** **Schack, Domnick, and Krebs.**
Ann. Hydrographie 29 (1901): 1-8.
 Zur Küstenkunde der Marschall- und Carolinen-Inseln. *With Charts.*
- New Caledonia.** *Questions Dipl. et Colon.* 11 (1901): 157-162. **Garnier.**
 L'Agriculture en Nouvelle-Calédonie. Par M. Charles Garnier. *With Map.*
- New South Wales.**
 Annual Mining Report of the Department of Mines and Agriculture, New South Wales, for the year 1899. Sydney, 1900. Size $13\frac{1}{2} \times 8\frac{1}{2}$, pp. 232. *Map, Plans, and Illustrations.*
 The minerals won during 1899 reached a value of £6,157,557, or over a million in excess of that for the previous year. The largest increases were in gold, silver-lead, silver, and copper.
- New South Wales.** *Travel* 5 (1901): 393-397. **Wrench.**
 The Coastland Districts of New South Wales. By G. T. Wrench. *With Illustrations.*
- New Zealand.** *T. and P. New Zealand I.*, 1899, 32 (1900): 183-188. **Hill.**
 On the Geology of the District between Napier and Puketitiri. By H. Hill.
- New Zealand.** *T. and P. New Zealand I.*, 1899, 32 (1900): 159-183. **Hutton.**
 The Geological History of New Zealand. By Captain F. W. Hutton, F.R.S.
- New Zealand.** *J.R.I. British Architects* 7 (1900): 481-491. **Seager.**
 Architectural Art in New Zealand. By S. Hurst Seager. *With Illustrations.*
- New Zealand—Lake Takapuna.** **Pond.**
T. and P. New Zealand I., 1899, 32 (1900): 241-242.
 On the Percentage of Chlorine in Lake Takapuna. By J. A. Pond.
 On tests of the lake-water at different depths, made with a view to proving whether the lake contains a substratum of sea-water. The result was in the negative.
- New Zealand—Maoris.** *T. and P. New Zealand I.*, 1899, 32 (1900): 253-270. **Smith.**
 The Tohunga-Maori: a Sketch. By S. Percy Smith.
 On the priest and his functions, among the Maoris.
- New Zealand—Maori Place-names.** **White.**
T. and P. New Zealand I., 1899, 32 (1900): 347-352.
 About the Native Names for Places. By Taylor White.
- New Zealand—Nelson.** *T. and P. New Zealand I.*, 1899, 32 (1900): 221-225. **Worley.**
 On the Nelson Boulder Bank. By W. F. Worley. *With Sections.*
- Western Australia.**
 Western Australia. Report of the Department of Mines for the year 1899. Perth, 1900. Size $13 \times 8\frac{1}{2}$, pp. 286. *Maps and Diagram. Presented by the Department of Mines, Perth.*
 The total yield of gold in 1899 is reported as reaching a value of £1,600,768, as compared with £1,041,712 in 1898. Of this sum the East Coolgardie field accounts for 53.44 per cent.

POLAR REGIONS.

Antarctic.

Borchgrevink.

First on the Antarctic Continent, being an account of the British Antarctic Expedition 1898-1900. By C. E. Borchgrevink. London: George Newnes, Ltd., 1901. Size 9 x 6, pp. xvi. and 334. *Portraits, Maps, and Illustrations.* Price 10s. 6d. *Presented by the Publisher.*

This work is practically an extension of the paper read last year before the Society, being a personal narrative of the course of the "Newnes" Antarctic Expedition, profusely illustrated from the excellent photographs taken by various members of the staff. Apart from the Appendices by Mr. Bernacchi and Lieut. Colbeck, it adds little to our knowledge of the scientific results of the expedition, which, it is to be hoped, will eventually be published in full.

Antarctic—German Expedition. *Petermanns M.* 47 (1901): 19-20.

Vanhöffen.

Von der deutschen Südpolarexpedition, Fischereiversuche. Von Dr. Ernst Vanhöffen.

On the proposed study of the fishes (especially economic) of the antarctic by the German expedition.

Antarctic—German Expedition.

Oberhummer

Jahresb. G. Ges. München (1898-1899): 94-134.

Die Deutsche Südpolarexpedition. Zweiter Bericht der Geographischen Gesellschaft in München erstattet von Prof. Dr. Eugen Oberhummer. *With Map.*

A report of progress down to November last.

Antarctic—Ice Caps. *C. Rd.* 131 (1900): 1260-1262.

Arctowski.

Les calottes glaciaires des régions antarctiques. Note de M. Henryk Arctowski.

Antarctic—"Southern Cross" Expedition.

The Antarctic Expedition. Conversazione at the Town Hall [Hobart], Wednesday, April 18, 1900. Welcome to the Leader, Scientific Staff, Captain, and Men. Size 8½ x 5½, pp. 14.

Antarctic—Zoology. *C. Rd.* 132 (1901): 168-169.

Topsent.

Les Spongiaires de l'expédition antarctique belge et la bipolarité des faunes. Note de M. E. Topsent.

Arctic—Abruzzi Expedition. *Riv. G. Italiana* 8 (1901): 49-59.

Abruzzi and Cagni.

La Conferenza del Duca degli Abruzzi e del Comandante Cagni alla Società Geografica Italiana.

Arctic—Andrée's Expedition. *Naturw. Wochenschrift* 16 (1901): 20-22.

Lorenzen.

Die Nachrichten von der Expedition Andrée's. Von A. Lorenzen.

Arctic—Bear Island. *Ymer* 20 (1900): 423-454.

Andersson.

Den Svenska expeditionen till Beeren Eiland sommaren 1899. Af Joh. Gunnar Andersson. *With Sketch-maps and Illustrations.*

Arctic Exploration. *T. and P. New Zealand I.*, 1899, 32 (1900): 384-396.

Hill.

Problems of Arctic Exploration bearing upon Recent Attempts to reach the North Pole. By H. Hill.

Arctic—Italian Expedition. *B.S.G. Italiana* 2 (1901): 121-180.

Abruzzi and Cagni.

Spedizione italiana nel Mare Artico sulla "Stella Polare." Conferenza da S.A.R. il Duca degli Abruzzi e dal Comandante U. Cagni. *With Maps and Plates.*

Arctic-Norwegian Expedition—Scientific Results.

Nansen.

The Norwegian North Polar Expedition, 1893-1896. Scientific Results, edited by Fridtjof Nansen. Volume ii. London: Longmans & Co., 1901. Size 12 x 9½, pp. lx., 136, 196, and 90. *Charts and Diagrams.* Price 30s. net. *Two Copies, one presented by the Council of the Fridtjof Nansen Fund, the other by the Publishers.*

This volume is produced in the same excellent style which marked its predecessor, issued early last year. The first section (sixth of the whole work) consists of a full discussion of the astronomical observations and statement of their results, by H. Geelmuyden. As regards the observations taken during the sledge expedition, including that which determined the most northerly point reached, it is frankly acknowledged that, taken as they often were during an actual struggle for life, in temperatures down to -40° C. (-40 Fahr.), they could not attain any high degree of accuracy. This does not, however, affect the general correctness of the results. The rest of the volume is made up with the results as regards terrestrial magnetism, pendulum observations, etc., by Aksel S. Steen and O. E. Schiøtz.

- Greenland.** *Verh. Ges. Erdk. Berlin* 27 (1900): 427-432. **Conwentz.**
 Zur Verbreitung des Moschusochsen und anderer Tiere in Nordost-Grönland.
 Von Prof. Dr. Conwentz. *With Map.*
 Based on Dr. Nathorst's observations (cf. *ante*, p. 310).

- Polar Exploration.** **Hugues.**
 Luigi Hugues. *Le Esplorazioni Polari nel secolo xix.* Milan: Ulrico Hoepli, 1901. Size 10 × 7, pp. xx. and 374. *Maps and Illustrations.* Price 12 lire. *Presented by the Publisher.*

A useful summary of arctic and antarctic exploration during the nineteenth century. It has been compiled with much care, and though the accounts of the separate voyages are necessarily brief, no important name has been omitted.

- Polar Exploration.** *Globus* 79 (1901): 13-17. **Singer.**
 Die Polarforschung im Jahre 1900. Von H. Singer.

- Polar Regions—Discovery.** *Riv. G. Italiana* 8 (1901): 18-41. **Porena.**
 Le scoperte geografiche del secolo xix. del Prof. Filippo Porena. V. Le Terre Polari.

MATHEMATICAL GEOGRAPHY.

- Cartography.** *M.G. Ges. Wien* 43 (1900): 31-48, 268-299. **Peucker.**
 Studien am Atlante Scolastico per la Geografia Fisica e Politica di Giuseppe Pennesi. Von Dr. Karl Peucker. *Also separate copy, presented by the Author.*

- Cartography.** *Izvestiya Russ. G.S.* 36 (1900): 457-462. **Vitkovski.**
 Advantages of an Equal-area Conical Projection. By V. Vitkovski. [In Russian.]

- Cartography.** **Zondervan.**
 Allgemeine Kartenkunde. Ein Abriss ihrer Geschichte und ihrer Methoden von Henri Zondervan. Leipzig: B. G. Teubner, 1901. Size 9½ × 6, pp. x. and 210. *Illustrations.* Price 4.60 m. *Presented by the Publisher.*

A revised translation of the work which appeared in Dutch in 1898, with additional illustrations. It forms a useful summary of the history and methods of map-making.

- Cartography.** **Margerie and Raveneau.**
 La Cartographie à l'Exposition Universelle de 1900. Par Emm. de Margerie et Louis Raveneau. Extrait des *Annales de Géographie*, tome ix., 1900 (No. 46 du 15 Juillet et 48 du 15 Novembre, 1900). Paris: A. Colin. Size 10 × 6½, pp. [52].

- Cartography.** *G.Z.* 7 (1901): 22-41. **Peucker.**
 Zur Kartographischen Darstellung der dritten Dimension. Von Dr. Karl Peucker.
 A note will be given on this.

- Determination of Position.** *Ann. Hydrographie* 28 (1900): 584-585. **Bolwin.**
 Nochmals die Bestimmung des Schiffsortes nach St. Hilaire ohne Konstruktion. Von G. Bolwin.

- Determination of Position.** *Rev. Maritime* 147 (1900): 491-510. **Decante.**
 Détermination de la position du navire quand l'horizon n'est pas visible. Par C. Decante.

- Figure of the Earth.** *Ann. Hydrographie* 28 (1900): 590-601. **Messerschmitt.**
 Ueber den Verlauf des Geoids auf den Kontinenten und auf den Ozeanen. Von Dr. J. B. Messerschmitt.

- Map Projection.** *American J. Sci.* 11 (1901): 1-24, 115-144. **Penfield.**
 The Stereographic Projection and its Possibilities, from a Graphical Standpoint. By S. L. Penfield. *With Illustrations.*

Nautical Almanac.

The American Ephemeris and Nautical Almanac for the year 1903. Washington: Bureau of Equipment, 1900. Size 11 × 7½, pp. 592. *Diagrams.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Atmospheric Electricity.** *Meteorolog. Z.* 17 (1900): 529-543. **Exner.**
 Ueber neuere Untersuchungen auf dem Gebiete der atmosphärischen Elektrizität. Von Prof. Franz Exner.

- Biogeography.** *Science* 12 (1900): 857-864. Ihering.
The History of the Neotropical Region. By Dr. H. von Ihering.
- Earthquakes.** *T. Ottawa Lit. and Sci. S.*, No. 2 (1899-1900): 119-132. Stupart.
Earthquakes and the Seismograph. By R. F. Stupart. *With Diagrams.*
- Forests and Climate.** *Meteorology. Z.* 17 (1900): 561-564. Schubert.
Prof. Dr. Schubert: Der Einfluss der Wälder auf das Klima.
- Geology—Age of the Earth.** *Brit. Assoc. Rep.* (1900): 369-379. Joly.
On the Geological Age of the Earth. By Prof. J. Joly, D.Sc., F.R.S.
On the method of estimating the age of the Earth by taking the amount of sodium contained in the sea as a measure of solvent denudation.
- Geomorphology.** *Geolog. Mag.* 8 (1901): 20-23. Tiddeman.
On the Formation of Reef Knolls. By R. H. Tiddeman.
- Geomorphology—Cirques.** *Ann. G.* 10 (1901): 10-16. Martonne.
Sur la formation des cirques. Par E. de Martonne. *Also separate copy, presented by the Author.*
Based on a detailed survey by the writer of two typical *cirques* on the Paringu, Carpathians.
- Gravity.** *T. Ottawa Lit. and Sci. S.* No. 2 (1899-1900): 149-161. Klotz.
Local Deflection of the Plumb Line. By Otto J. Clotz. *With Maps and Diagrams.*
- Land-forms.** Davis.
The Physical Geography of the Lands. By Prof. W. M. Davis. (Reprinted from *Popular Science Monthly*, vol. lvii. No. 2, pp. 157-170, June, 1900.) Size 9½ × 6½.
Presented by the Author.
Illustrates the need for explanation and correlation in the study of land-forms.
- Limnology.** *Rev. G.* 48 (1901): 125-130. Corcelle.
La Limnologie, Études nouvelles sur les lacs français. Par J. Corcelle.
- Meteorology.** *P. Philosoph. S. Glasgow* 31 (1899-1900): 145-151. Robertson.
On the Equilibrium of a Column of Air, and the Atmospheric Temperature Gradient. By David Robertson, B.Sc.
- Meteorology—Atmospheric Movements.** Bjerknes.
Monthly Weather Rev. 28 (1900): 434-443.
The dynamic principle of the circulatory movements in the atmosphere. By Prof. V. Bjerknes. *With Diagrams.*
- Meteorology—Methods.** *P.R.J.* 16 (1900): 97-113. Callendar.
Measuring Extreme Temperatures. By Prof. H. L. Callendar.
- Meteorology—Rainfall.** Herbertson.
The Distribution of Rainfall over the Land. By Andrew J. Herbertson, PH.D.
London: John Murray, 1901. Size 10 × 6½, pp. 70. *Maps and Diagrams.*
This is one of the extra publications of the Royal Geographical Society. It is a careful study, based on all available information, of the distribution of rainfall over the Earth's surface, and gives for the first time rainfall maps of the whole world for each separate month of the year.
- Meteorology—Tropical Rainfall.** *Meteorolog. Z.* 17 (1900): 572-574. Hann.
Beiträge zur Kenntniss tropischer Regenverhältnisse. Von J. Hann.
- Oceanography.** *Ann. Rep. Smithsonian I.* (1898): 407-425. Thoulet.
Oceanography. By M. J. Thoulet.
Translation of an article in the *Revue des Deux Mondes.*
- Oceanography—Baltic.** *Ann. Hydrographie* 28 (1900): 586-590. Knudsen.
Erneuerung der unteren Wasserschichte in der Ostsee. Von Martin Knudsen.
- Oceanography—Black Sea.** *Die Natur* 50 (1901): 1-4, 13-15, 25-58. Toula.
Die geologische Geschichte des schwarzen Meeres. Von Hofrat Prof. F. Toula.
- Oceanography—Density.** *C. Rd.* 131 (1900): 1267-1269. Thoulet.
Sur la détermination de la densité de l'eau de mer. Note de M. J. Thoulet.
[Extrait.] (*Also separate copy, presented by the Author.*)

Oceanography—North Atlantic.**Dickson.**

The Circulation of the Surface Waters of the North Atlantic Ocean. By H. N. Dickson, B.Sc. (Philosophical Transactions of the Royal Society of London. Series A. Vol. 196, pp. 61-203.) London: Dulau & Co., 1901. Size 12 x 9. *Maps. Price 10s. Presented by the Author.*

This important paper will receive special notice.

Regional Geography.**Gribaudi.**

Prof. Pietro Gribaudi. Un buon esempio da imitarsi per lo studio della geografia di casa nostra. (Estratto dalla *Rivista Geografica Italiana*. Anno vii. Fasc. ix., 1900.) Firenze, 1900. Size 9½ x 6½, pp. 8. *Presented by the Author.*

The writer urges the importance of a study of the Regional Geography of Italy, on the lines of Dr. Mill's proposed monographs of the Ordnance Survey Sheets.

Regional Geography. Riv. G. Italiana 7 (1900): 599-602.**Marinelli.**

Un esempio nostrale, a proposito di monografie locali. Nota di olinto Marinelli.

The writer calls attention to a memoir recently issued by the "Stazione Sperimentale agraria di Udine," as an excellent example of the treatment of regional geography on the lines advocated for Great Britain by Dr. Mill.

Rivers. B. American Bureau G. 1 (1900): 337-341.**Dowling.**

A Study of the River. By Ruth E. Dowling.

Terrestrial Magnetism. C. Rd. 132 (1901): 30-32.**Moureaux.**

Sur la valeur absolue des éléments magnétiques au 1^{er} janvier 1901. Note de M. Th. Moureaux.

Terrestrial Magnetism. Terrestrial Magnetism 5 (1900): 97-110.**Nippoldt.**

The present status of the theory of the Earth's Magnetism. By A. Nippoldt.

Wave Surfaces. Scottish G. Mag. 17 (1901): 1-11.**Cornish.**

On the Formation of Wave Surfaces in Sand. By Vaughan Cornish. *With Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.**Anthropology—The Basques. Globus 79 (1901): 117-124.****Buschan.**

Der Stand unserer Kenntnis über die Basken. Von Georg Buschan.

Civilizations.**Matteuzzi.**

Les facteurs de l'évolution des Peuples, ou l'influence du milieu physique et tellurique et de l'hérédité des caractères acquis dans l'évolution et la dissolution des peuples, par le Dr Auguste Matteuzzi, traduit de l'italien par M^{lle} I. Gatti de Gamond. Paris: F. Alcan, 1900. Size 8½ x 5½, pp. 412. *Presented by the Author.*

A thoughtful study of the development of civilizations as influenced by environment coupled with the persistence of acquired characters.

Commerce.**Levasseur.**

Des changements survenus au XIX^e siècle dans les conditions du commerce par suite du progrès des voies et moyens de communication. Par M. Émile Levasseur. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. 1^{re} section—Question ii.) Paris: Société de Géographie Commerciale. Size 11 x 7, pp. 36.

Commercial—Coal Supply.

Internal Commerce. Coal Trade of the United States and the World's Coal Supply and Trade. [From the Summary of Commerce and Finance for April, 1900.] Treasury Department, Bureau of Statistics. Size 12 x 9½, pp. 2817-2928. *Diagram. Presented by the Philadelphia Commercial Museums.*

Commercial—Free Port.**Roux.**

Des meilleures conditions de l'établissement d'un port Franc. Par Charles Roux. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. 1^{re} Section—Question iii.) Paris: Société de Géographie Commerciale. Size 10½ x 7, pp. 22.

Commercial Geography.**Aspe-Fleurimont.**

De la création, de l'organisation et de l'outillage des grands marchés de denrées et de matières premières. Par M. Aspe-Fleurimont. (Congrès International de Géographie économique et Commerciale. Rapports sur les questions mises spécialement à l'étude. 2^e Section—Question II.) Paris: Société de Géographie Commerciale. Size 11 x 7, pp. 6.

Commercial Geography.**Spire.**

Quelles sont les meilleures conditions d'organisation d'une Exploration économique et commerciale. Par le Docteur Spire. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. 1^{re} Section—Question i.) Paris: Société de Géographie Commerciale. Size 10½ × 7, pp. 16.

Commercial Geography—Cork Oak. *Abh. G. Ges. Wien* 2 (1900): 239–313. **Müller.**

Ueber die Korkeiche (*Quercus suber* L. und *occidentalis* Gay). Ein Beitrag zur Pflanzen- und Handelsgeographie. Von Dr. Eugen Anton Müller. *With Map and Diagrams.*

A careful study of the distribution, history, and economic importance of the cork oak.

Commercial—Paraguay-tea.**Fischer-Treuenfeld.**

Deutsche Rundschau G. 23 (1901): 193–210.

Paraguaythee. Von R. v. Fischer-Treuenfeld. *With Illustrations.*

Commercial—Timber Production. *Ann. G.* 10 (1901): 72–75.**Raveneau.**

La production du bois dans le monde. Par L. Raveneau.

Historical—Dias.*Die Natur* 50 (1901): 7–9, 15–18.

Die erste Umseglung des Kaps der guten Hoffnung durch Bartholomeu Dias. Von H. B.

BIOGRAPHY.**Drapeyron.***Rev. G.* 48 (1901): 83–88.**Levasseur and others.**

M. Ludovic Drapeyron. Obsèques de M. Ludovic Drapeyron, Directeur de la *Revue de Géographie.*

Ibarreta.*Deutsche Rundschau G.* 23 (1901): 181–184.**Greger.**

Enrique de Ibarreta. Von J. Greger. *With Portrait.*

The subject of this memoir was murdered by the Indians of the Gran Chaco, as already announced in the *Journal.*

Korshinsky.*Deutsche Rundschau G.* 23 (1901): 231–232.**Stenin.**

Prof. S. J. Korshinsky. Von P. v. Stenin. *With Portrait.*

Prof. Korshinsky, who died in December last, was one of the best authorities on the flora of the Russian empire.

Pinto.*Rev. Française* 26 (1901): 90–105.**Joûbert.**

L'explorateur Portugais Serpa Pinto. Par M. J. Joûbert.

Pinto.*A travers le Monde, Tour du Monde* 7 (1901): 29.

Serpa Pinto. *With Portrait.*

Preuss.*Deutsche Rundschau G.* 23 (1901): 229–230.

Dr. Paul Rudolf Preuss. *With Portrait.*

Torell.*Ymer* 20 (1900): 455–459.**Nathorst.**

Otto Torell den vetenskapliga polarforskningens grundläggare. Af A. G. Nathorst. *With Portrait.*

Volkens.*Deutsche Rundschau G.* 23 (1901): 179–181.

Prof. Dr. Georg Volkens. *With Portrait.*

Prof. Volkens, well known for his botanical work on Kilimanjaro, has lately returned from a scientific expedition to the Carolines.

Waldseemüller.*B.S.G. de l'Est* 21 (1900): 221–229.**Gallois.**

Waldseemüller chanoine de Saint-Dié. Par L. Gallois.

GENERAL.**Acclimatization.***B.S.G. Lyon* 17 (1901): 44–66.**Sambon.**

L'acclimatation des Européens dans les régions tropicales. Par M. le Docteur L. Westenra-Sambon.

Alpine Club.*Alpine J.* 20 (1901): 295–305.**Conway and Freshfield.**

The Future of the Alpine Club. By Sir Martin Conway and Douglas W. Freshfield.

Proposals for the modification of the qualifications for the Alpine Club, and of the form of its *Journal*, so as to make the latter a complete record of mountain exploration in all parts of the globe.

Belgium. *B.S.R. Belge G.* 24 (1900): 233-258, 281-312. **Du Bois.**

Le Réveil de la tendance des Belges à s'expatrier. Par Albert Du Bois.

On the recent awakening of Belgium to colonial enterprise, and the need for a Belgian merchant marine.

Climate and Health. *B.S. d'Études Colon.* 8 (1901): 27-33. ———

De la dégénérescence de la race européenne sous le climat équatorial.

Cologne Geographical Society. *Rev. G.* 48 (1901): 10-18. **Drapeyron.**

Une société allemande de géographie. La Société de géographie de Cologne; son organisation (1886-1900). Par L. Drapeyron.

Colonial Companies. ———

Recueil des Sociétés Coloniales et Maritimes. Deuxième Année, 1901. Bruxelles: Société d'Études Coloniales de Belgique, 1901. Size $9\frac{1}{2} \times 6$, pp. vi. and 386.

Map. Presented by the Société d'Études Coloniales.

Statistical information respecting the principal colonial and shipping companies of European powers, especially Belgium. Of British companies, only those having dealings with Africa are mentioned, only ten pages in all being devoted to these.

Colonial Systems. ———

Colonial Systems of the World. The Colonies, Protectorates, Dependencies, and Spheres of Influence of all Nations exercising authority outside their immediate territory; showing form of government, area, population, revenue, etc. [From Summary of Commerce and Finance for December, 1898.] Treasury Department, Bureau of Statistics. Size $12 \times 9\frac{1}{2}$, pp. 38. *Map. Presented by the Philadelphia Commercial Museums.*

Education. *B. American Bureau G.* 1 (1900): 301-308. **Allin.**

Some Pedagogical Principles underlying the Teaching of Geography. By Arthur Allin.

Education—Pictures. *B. American Bureau G.* 1 (1900): 309-315. **Wood.**

Pictures in the Teaching of Geography. By John A. Wood.

Exhibition. *National G. Mag.* 12 (1901): 49-53. **Austin.**

An Around-the-World American Exposition. By Hon. O. P. Austin. *With Map.*

A suggestion for a floating exhibition, to carry samples of American merchandise all over the world.

Fishery Congress. ———

Travaux et comptes-rendus des séances du Congrès International de Pêches Maritimes et Fluviales de Bayonne-Biarritz du 25 au 31 Juillet 1899. Paris: A. Challamel, 1900. Size $10 \times 6\frac{1}{2}$, pp. xxiv. and 184. *Plates.*

Geographical Names. *B. American Bureau G.* 1 (1900): 316-327. **Rupert.**

The significance and importance of Geographical Names. By Wm. W. Rupert.

Hints to Travellers. **Blim and Rollet de l'Isle.**

Manuel de l'Explorateur, procédés de levers rapides et de détail; détermination astronomique des positions géographiques. Par E. Blim et M. Rollet de l'Isle. Paris: Gauthier-Villars, 1899. Size $7\frac{1}{2} \times 5$, pp. viii. and 260. *Illustrations. Price 4s. 6d.*

Useful hints on surveying with compass, theodolite, etc.

Medical Geography. *C.Rd.* 132 (1901): 114-117. **Lannelongue, Achard, and Gaillard.**

De l'influence du climat sur l'évolution de la Tuberculose pleuro-pulmonaire expérimentale. Par MM. Lannelongue, Achard et Gaillard.

NEW MAPS.

By E. A. REEVES, Map Curator, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from March 1 to 31, 1901.

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Service Géographique de l'Armée, Paris.

Asie. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Sheets: Nos. 32-132, Isles Hokoubou; Nos. 28-132, Kagoshima and separate sheet of the Lower Basin of the Yang-tse-Kiang. Service Géographique de l'Armée, Paris. Price 1.25 fr. and 1.50 fr.

These are three sheets of the map of portions of Asia on the scale of 1 : 1,000,000, now in course of publication by the Service Géographique de l'Armée, Paris. Sheets Nos. 32-132 and Nos. 28-132 contain the southern islands of Japan. The third sheet, entitled "Bassin Inférieur du Yang-tse-Kiang," is an important one, and includes the course of that river from Hu-keu, about sixty miles above Ngan-king, to the sea, and the country to the south and north from lat. 30° to 34° N. There is also on this sheet an explanatory note concerning the system of transliteration of Chinese names. The style in which these sheets have been produced is similar to that of the others of the same series that have already appeared.

Indian Government Surveys.**Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 27 N.E., parts of district Ratnágiri (Bombay Presidency), 1900; 59 S.W., parts of districts Bellari and Anantapur (Madras Presidency), Kadúr, Tímakúr, Chitaldru and Shimoga (Mysore State), 1900; 40, parts of districts Ratnágiri, Sholapur, and Satara and Kolapur Native State (Bombay Presidency), additions to 1896; 54, parts of districts Hoshangabad, Nimár, Wardha and Betúl (Central Provinces), Amráoti, Akola, Buldána and Ellichpur (Berar), Khandesh (Bombay Presidency), and of Native State Indore (C. I. Agency), additions to 1899; 80, parts of districts Madura, Tanjore and Ramnad (Madras Presidency) and Tondiman (Native State), additions to 1900.—Assam Survey, 1 inch to a mile. No. 162, North Lushai Hills, Seasons 1897-99, 1900.—Bengal Survey, 1 inch to a mile. No. 138, District Puri, Seasons 1890-91 and 94-95, 1900.—Upper Burma Survey, 1 inch to a mile. No. 403, Southern Shan States, Season 1897-98, 1900.—Central Provinces Survey, 1 inch to a mile. No. 68, parts of Districts Chhindwára, Narsinghpur and Seoni (Central Provinces), Seasons 1862-63, 1865-67, 1869-70. 1899.—Central India and Rajputana Survey, 1 inch to a mile. No. 420, parts of Districts Saugor and Damoh (Central Provinces), and Native States of Panna, Bijáwar, and Tehri (C. I. Agency), Seasons 1863-64, 65-66, and 1870-71, 1900.—Burma-China Boundary Commission, 1 inch to 4 miles, parts of the Shan States and China, Season 1898-99. 1900.—Index to the Survey of the Yenangyat Oil Field, Upper Burma, 1 inch to a mile. Sheets 124-126 (on one sheet), Pakokku District, Season 1899-1900.—District Hugli, Bengal, 1 inch to 8 miles. 1900.—District Kohát, Punjab, 1 inch to 8 miles. 1900.—Berar (with and without hill shading), 1 inch to 24 miles. 1896.—District Midnapore, 1 inch to 4 miles. 1899.—District Mymensingh, Lower Provinces, Bengal, 1 inch to 4 miles. 1900.—Rájputána Agency, 2nd edition, 1 inch to 16 miles. 1900. 2 sheets.—Western Bengal, 1 inch to 8 miles. Sheet No. 8, Districts Hazáribágh, Gava, Sonthál Parganas, Birbhum, Burdwan, Bankura, Manbhum, Midnapore, Hugli, Singhbhum, Ránci, Murshidábád, and Bhogalpur. 1899.—Eastern Bengal, 1 inch to 8 miles. Sheet No. 13, Murshidábád, Malda, Birbhum, Bogra, Rájsháhi, Pabna, Mymensingh, Burdwan, Hugli, Nadia, Jessore, Khulna, Backergunge, Faridpur, Dacca, Tippera and Noakhali. 1899.—Central India Agency, 1 inch to 16 miles. 1899. 2 sheets and index.—*Presented by H.M. Secretary of State for India through the India Office.*

Japan.**Yamasaki.**

Das grosse Riku-u-Erdbeben im nördlichen Honshū am 31 Aug. 1896. Scale 1:1,000,000 or 15·8 stat. miles to an inch. Von Dr. N. Yamasaki. *Petermanns Geographische Mitteilungen*, Jahrgang 1900. Taf. 20. Gotha: Justus Perthes, 1900. *Presented by the Publisher.*

This map is to illustrate a paper on the great Riku-u earthquake of Japan by Dr. N. Yamasaki, in *Petermanns Geographische Mitteilungen* for November, 1900. It is based upon a sheet of Hassenstein's atlas of Japan, on which the special information connected with the earthquake has been added in red.

AFRICA.**Africa.****Service Géographique de l'Armée, Paris.**

Carte d'Afrique. Scale 1:2,000,000 or 31·6 stat. miles to an inch. Sheets: 21, Khartoum; 29, Gondar; 30, Berbera; 33, Benin; 38, Moukdicha; 59, Ville du Cap. Service Géographique de l'Armée, Paris. *Price 1 fr. each sheet.*

German East Africa.**Kiepert.**

Deutsch-Ostafrika. Scale 1:2,000,000 or 31·6 stat. miles to an inch. Von Dr. R. Kiepert. Geographische Verlagshandlung, D. Reimer (E. Vohsen), Berlin.

A new edition of a somewhat roughly executed map of German East Africa. It is, however, useful for general reference, and shows clearly the various districts into which the country has been divided, together with the principal mineral and vegetable products, with their localities.

Tunis.**Service Géographique de l'Armée, Paris.**

Tunis. Scale 1:100,000 or 1·6 stat. miles to an inch. Sheet xxvi., Djebibina. *Price 1.20 fr.* Tunisie. Scale 1:50,000 or 0·8 stat. mile to an inch. Sheets: i., Kef Abbed; xxvii., Medjez el Bab. *Price 1.50 fr. each sheet.* Service Géographique de l'Armée, Paris.

NORTH AMERICA.

Canada.

Department of the Interior, Ottawa.

Map of the Dominion of Canada. Scale 1 : 6,336,000 or 100 stat. miles to an inch.

Department of the Interior, Ottawa, 1901. *Presented by James White, Esq.*

This is the second edition of a small-scale, general map of the Dominion of Canada, on one sheet. It is without hill shading, but shows very clearly all the principal political divisions, by means of colour tinting. The boundaries are indicated by a black broken line, although that between British and United States territory, from Mount St. Elias to lat. 56° N., has been left undefined. The new railway from the head of the Lynn canal to Lake Bennett is laid down. The map has been compiled from the geological survey maps of Canada, and from other available maps and surveys.

Maryland.

Maryland Geological Survey.

Physical Atlas of Maryland. Allegany County. Topography and Election Districts, Geology and Soils. Maryland Geological Survey. Scale 1 : 62,500 or 0·97 stat. mile to an inch. The John Hopkins Press, Baltimore, 1900. 6 sheets. *Presented by the Maryland Geological Survey.*

This atlas contains two maps of the Allegany County, Maryland, one showing the topography and election districts, and the other the geological formations and agricultural soils. In the former the relief is indicated by a series of brown contour-lines at intervals of 20 feet, whilst the rivers are in blue, and in the latter the geology is shown by a system of colours and conventional signs. Each of the maps consists of three sheets, which, as regards style of production, are equal to the other excellent maps of the United States Geological Survey. They are accompanied by a volume of text.

CENTRAL AND SOUTH AMERICA.

Central America.

Petermanns Geographische Mittheilungen.

Die neue Grenze zwischen Costarica und Columbia. Scale 1 : 1,500,000 or 23·7 stat. miles to an inch. *Petermanns Geographische Mittheilungen*, Jahrgang 1900.

Taf. 22. Gotha : Justus Perthes, 1900. *Presented by the Publisher.*

In addition to the new boundary between Costa Rica and Colombia as settled by arbitration in September, 1900, which is the principal feature on this map, there are two other lines indicated, showing respectively the regions previously claimed by the two countries. The new boundary runs from the Atlantic to the Pacific coast between these two lines, and passes from Pta. Mona to the watershed between the Tiliri and General, and thence south to Pta. Burica.

CHARTS.

Admiralty Charts.

Hydrographic Department, Admiralty.

Charts and Plans published by the Hydrographic Department, Admiralty, January and February, 1901. *Presented by the Hydrographic Department, Admiralty.*

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2328. Plans of Arendal iulet, and approaches to Grimstad on this chart.			
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320. Plan of Superior bay on	{ New plan.		
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1176. Plan of Lagoon entrance,	{ New plan.		
Suvarov islands.	{ Lagoon entrance, Suvarov islands		1176

Charts that have received Important Corrections.

No. A-P, Index charts, 16 sheets. Y, Index chart of Sailing Directions. 28, England, south coast:—Salcombe river. 1967, England, south coast:—Plymouth sound. 240, England, south coast:—Hamoaze 2328, Norway, south coast:—Christiansand to Sandöen. 2296, Gulf of Bothnia:—South Quarken to Hornslandet. 2298, Gulf of Bothnia, sheet iii. 2116, Denmark:—Great and Little belts. 1126, Ports and anchorages in Corsica. 1611, Ports and anchorages in Dalmatia. 1582, Harbours on the eastern shore of the Adriatic. 2961, Canada:—Eastern part of the bay of Quinte. 2580, Cuba, eastern portion. 478, Puerto Rico:—Port San Juan. Port Arecibo. 1331, Argentina:—Port Belgrano. 2431, Alaska:—Port Simpson to Cross sound. 2463, Alaska:—Port McArthur to Windham bay. 1843, Africa, south coast:—Buffalo river. 851, Mosambique channel:—Bassas da India and Europe island. 923, Harbours and anchorages in the Red sea. 942A, Eastern archipelago, eastern portion. 932, Harbours and anchorages on the coasts of Java. 2575, Celebes sea, eastern part. 1760, China, east coast:—The Brothers to Ockseu islands. 2409, China sea:—West coast of Formosa. 127, Japan:—Hirado-no-Seto to Simonoseki strait. 2710, Japan:—Tsu-sima sound. 1485, Caroline islands:—Yap island. Port Tomil.

(J. D. Potter, Agent.)

North Atlantic Ocean.

Meteorological Office, London.

Charts illustrating the Weather of the North Atlantic Ocean in the Winter of 1898-99. Published by the Meteorological Office, London, 1901. *Price 6s. 6d.*
Presented by the Meteorological Office.

The succession of severe gales over the North Atlantic Ocean during the winter of 1898-99, taken in conjunction with the remarkable climatic conditions on both sides of the ocean, form a most interesting subject for investigation. It has, therefore, been considered advisable by the Meteorological Council to prepare a permanent meteorological record of the North Atlantic for this period, and this has been accomplished, as perfectly as the observations available has rendered possible, in the above-mentioned charts, which indicate the state of the barometer, thermometer and wind for each day from December 18, 1898, to February 15, 1899. These are all drawn on one scale, and are accompanied by notes which add to their interest. They have been prepared from a great number of observations and records, which have been placed at the disposal of the Meteorological Council by the various shipping companies. The responsible and laborious task of compilation was entrusted in the first place to the late Navigating Lieut. C. W. Baillie, R.N., and after his death, which has occasioned some delay in the publication of the charts, the work has been completed by Commander Campbell Hepworth, R.N.R.

North Atlantic Ocean and Mediterranean Sea.

Meteorological Office, London.

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for April, 1901. Issued by the Meteorological Office, London. *Price 6d.* *Presented by the Meteorological Office.*

United States Charts.

United States Hydrographic Office.

Pilot Charts of the North Atlantic Ocean for March and April, 1901, and of the North Pacific for April, 1901. U.S. Hydrographic Office, Washington, D.C.
Presented by the U.S. Hydrographic Office.

PHOTOGRAPHS.

Sierra Leone.

Alldridge.

Twenty-eight Photographs of the Hinterland of Sierra Leone, by T. J. Alldridge, Esq. *Presented by T. J. Alldridge, Esq.*

During Mr. Alldridge's journeys in Sierra Leone he has travelled in some of the districts of the interior concerning which comparatively little information has been obtained, and the photographs he has taken, a set of which he has been good enough to present to the Society, are therefore of exceptional interest. As will be seen from the titles, the subjects are varied, and have been well chosen to illustrate the types of natives, their mode of life, dwellings, industries, customs, dances, etc. The photographs are half-plate size, and most of them are extremely good.

(1) Dancing girls, Bandasuma; (2) Poro boys, Gaura country; (3) Upper Mendi chief; (4) Group of Bundu girls, Vassa country; (5) The slave trade, Mongeri; (6) Balenjeh players, Sulima; (7) War boys, Bombari country; (8) A Fetish dwarf, Bambara country; (9) Bundu devil, Upper Mendi; (10) The Nefari devil dance, Sulima; (11) Mendi women fishing, Gigbama, Tunkia; (12) Graves at Waima, Konuo country; (13) Dancing girls, Sulima; (14) Group of Tasso men, Imperri, Sherbro; (15) Pounding rice, Mendi; (16) Poro boy, Juru, Mendi; (17) Bundu girls, Upper Mendi; (18) Bunju dancers, Upper Mendi; (19) Group of chiefs, Sulima; (20) Mendi women playing the Sehgora; (21) The Pamawura flower, Upper Mendi; (22) A camwood tree, Upper Mendi; (23) The town drums, Massaia, near Falaba; (24) Weaving cloth, Massaia; (25) Dancing girls, Barri country; (26) Bundu devil and her Digbas; (27) Mendi boys beating the Samba (tom-tom); (28) Mandingos playing the Balenjeh, Falaba.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

1-inch Scale.

	Price per sheet.	
	s.	d.
1. England and Wales, old series, in black, with outline and hill hachures.		
Size 36 × 24	2	6
Size 18 × 12	1	0
2. Ditto, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
3.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
4.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1	0
5.*Ditto, hills hachured in brown, contours red, roads brown, water blue, magnetic variation shown, latitude and longitude not marked. Size		

* Publication in progress.

	Price per sheet.
18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1 0
Combined sheets	1 6
6. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1 9
7.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1 6
8. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
9. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
10.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted 9d. to	1 0
Folded in cover 1s. to	1 6
4 Miles to an Inch.	
11.*England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1 6
12.*County maps, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. Kent, size 22½ × 17 inches. Northumberland and Durham (combined), size 17½ × 23½ inches. In sheets, unmounted	0 6
Folded in covers	0 9
6-Inch Scale.	
13. Great Britain, water coloured blue or black lined, contours in black, latitude and longitude marked. Heliozincographed and photozincographed. Size 18 × 12 inches . .	1 0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6
1:2500 Scale.	
15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2s. 6d. to 23s., according to the amount of colouring. This form is gradually being superseded by 15.	
Town Scales.	
17. 1/2500 scale, houses stippled. Size 38 × 25½	2 6
18. Ditto, houses ruled. Size 38 × 25½	2 6
19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2s. 6d. to 15s., according to the amount of colouring. Applies to unrevised only.	
20. 5-foot scale, houses stippled. Revised. Size 36 × 24 inches	2 6
Index Maps.	
21. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0 2
22.*Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
23.*Index to the sheets of the 1:2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.	

* Publication in progress.



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JOURNEYS IN THE LINYANTI REGION.*

By PERCY C. REID.

ON June 15, 1899, we left Kazungula, and, keeping along the right bank of the Linyanti river, headed nearly due west. At the end of about 7 miles we came to the Sebuba rapids, which were the only obstacle to navigation we met with on our trip. It is, however, only at seasons of low water that these rapids constitute any serious difficulty, and even then native canoes are able to pass up them. Our road had led most of the way along the foot of some low stony hills, which, at the rapids, come right down to the river's bank. From Sebuba we continued to march along the right bank of the river for about 25 miles. The same low hills, covered with dense jungle, were on our left hand all the way, and indeed continue for about 55 miles from Kazungula. The river meanders through a low flat plain at their base, which stretches away northwards as far as the eye can reach. While, of course, the hills hem in the river on the south and prevent its overflow, the plain to the north is for many months of the year flooded from 1 to 3 or even more feet deep.

On June 19 we arrived at a spot where the river, including its inundation, narrowed considerably owing to some rising ground on the north side. Here some natives informed us, though without any real truth, that the country ahead of us was impassable for our donkeys, owing to the thickness of the bush, and we therefore, with the help of a couple of canoes, ferried our goods and swam our donkeys over. Thenceforth we proceeded along the left bank. A march of about 3 miles through flooded country brought us to the village of

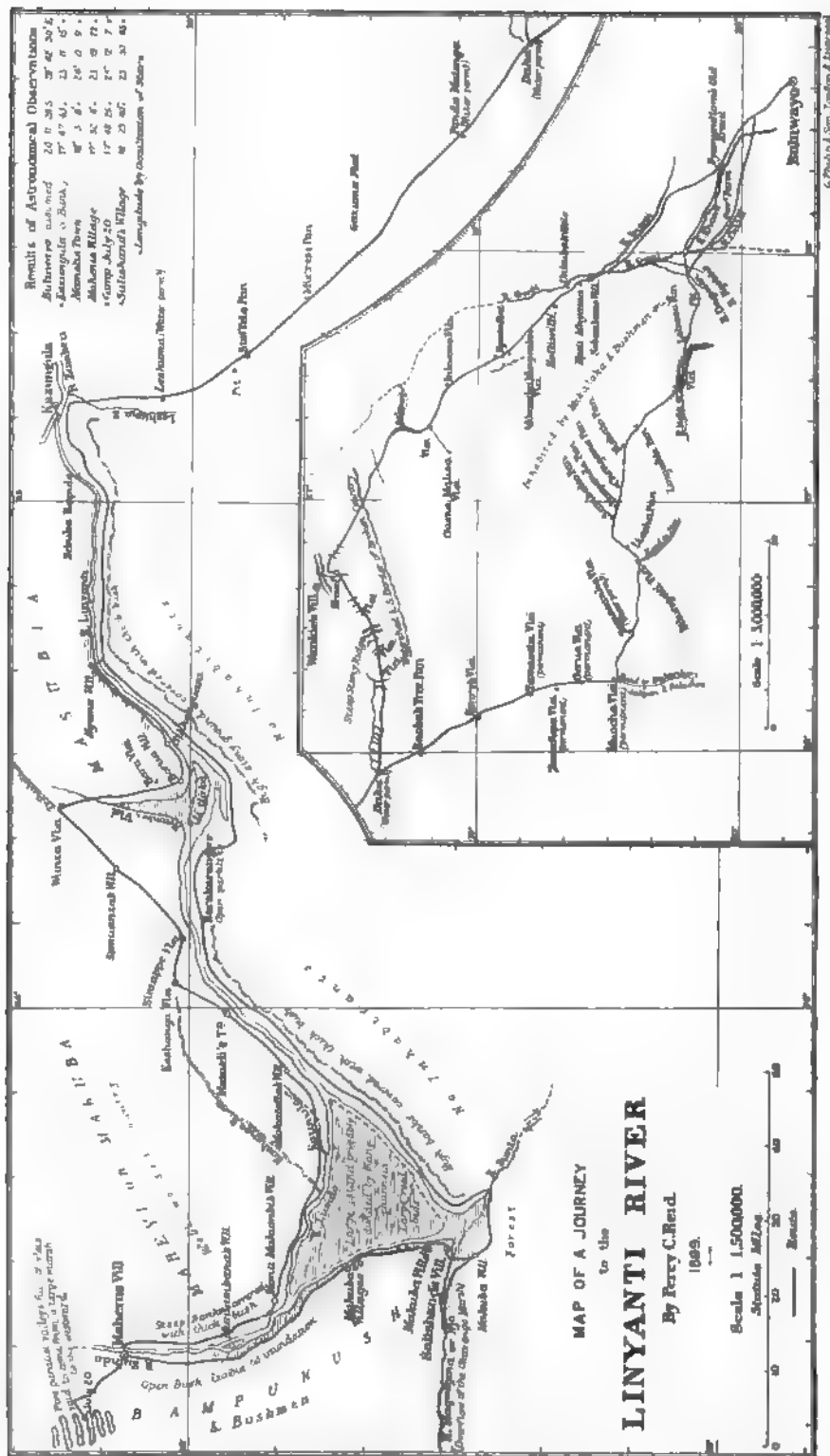
* Read at the Royal Geographical Society, March 25, 1901.

Ngoma, where we were able to purchase a little milk and butter, which we relished immensely.

From Ngoma we marched south-west for 13 miles to the village of Sikhonguani, and then 3 miles west to the village of Boruha. The road was good and dry, except for one or two small patches of inundation, the country on the whole being somewhat higher than to the east of Ngoma. At Boruha we were just on the edge of the first of the big reed-beds of the Linyanti, as a reference to the map will show. This is known to the natives as Li-tlaka, or The Reeds. Leaving Boruha, we had to march very nearly north to circumvent a large arm of the river, called Nyambez, which of course is the same word as Zambezi. The Nyambez is full of deep clear water nearly 2 miles wide, I should say, at its southern end, and surrounded by a fringe of reeds. Where we crossed it near its head, it was merely a swampy reed-bed about 200 yards wide with a couple of small rivulets running through it. We camped, after crossing, at a vley called Wunza, and were now on the path from Shesheke to Mameli's village. This path we followed in a south-westerly direction, through a pleasant open park-like country, the Linyanti being some miles away on our left.

At the end of 10 miles we came to Semuanza's village, and the next day moved on a further 13 miles to Sinieppe vley. Here the Linyanti was about 3 miles away to the south. Between 4 and 5 miles to the west from Sinieppe we came to Kashanga vley, from which place a journey of 6 miles south-south-west brought us to Mameli's. Major Gibbons, in the paper he recently read before the Society, has fully described Mameli and his village, which is a good mile or more from the banks of the river. Mameli was certainly a very fair specimen of a native, and full of protestations of his wish to assist us. The main traits of his character that I saw were his love of native beer (which, as he eats absolutely nothing, constitutes both his food and his drink), and his love for his youngest child, a dirty little imp of about two years old. The inhabitants of the village must number about 2000, and it is by far the most important place we came across.

As usual, when, after a two days' halt, we prepared to move on again, all sorts of difficulties were discovered by Mameli to have cropped up. There was no food along the road in front; the bush was too dense for our donkeys; we should never get across the river at the spot we wished; there were no boys, as promised, who would take our letters back to Kazungula; and there were no guides, as promised, to show us the way. It would be much better, Mameli said, that we should stay another day, and then cross to the south side of the Linyanti river. Of course we declined to listen to his arguments, and marched off to find our own road and overcome all the pictured difficulties. But perhaps I must not be too hard on Mameli, for, as we afterwards discovered, a meeting of Barotse chiefs was even then being held at



Shesheke to discuss the advisability of turning us back by force from this part of the country, which is looked on by Lewanika as his special preserve. Luckily wiser counsels prevailed, but my friend and I could not help smiling when we heard the story, at the idea of a miserable set of men like the Barotse trying to turn us back.

From Mameli's we marched 12 miles through open forest, slightly west of south, and then debouched on to an open plain which bounds the river, the trees on the opposite bank of which we could see over the beds of reeds, some 2 miles away. Turning nearly west, we marched on for another 25 miles, with the forest on our right and the open plain on our left. Soon after starting we had to cross a small spruit or river-bed, and here I noticed that the water was flowing out of, and not into, the Linyanti. It was my first introduction to the winter or dry season overflow of the Linyanti. We were now, of course, travelling along the northern side of the second and largest of the swamps and reed-beds of that river. Some 3 or 4 miles further on we bore slightly more to the northward, and, entering the bush country, we crossed and afterwards travelled along a distinct river some 20 to 30 feet wide, also flowing strongly out of the Linyanti. Its name was Kazinzila. I am inclined to think that it is not really a river or affluent of the Linyanti, but rather that it is the ancient bed of the river itself, or possibly of a loop. Away on the flat to the south of us was pointed out the position of Livingstone's old house, and of Sebituane's grave, near the old town of Linyanti, but, owing to the floods, we were not able to approach. In a fortnight's time, we were told, Mameli would come to hunt here. The lechwee, situtunga, and reed-buck would then be driven by the increasing floods from their usual haunts in the reed-beds, and forced to take refuge in the patches of wood on the numerous raised "islands" with which the plain is clothed. These islands are then surrounded by the natives in canoes, and the game is speared as it is driven out into the waters.

A few miles farther on we came to another river-bed, the Kashanga, now still dry, but which in excessively wet seasons contains much water. Indeed, on occasions, as for instance in a memorable year about 1880, "when the Mokwai, Lewanika's sister, came down to Kazungula to hunt," the Kashanga was so full that the water came right past Kashanga vley (our camp to the north of Mameli's), and flowed there again into the Linyanti. From about here the Linyanti changed its direction; the big swamp was finished, and we marched north-north-west for nearly 40 miles, when we arrived opposite to Maheni's village, where we proposed to cross. During the greater part of this distance the valley had narrowed to some 3 or 4 miles, through which the river twisted and turned in all directions, the left bank, on which we were, being considerably the higher, and in consequence dry and covered with thick wood.

By the way, I must mention that here the river is known as the Liondo, evidently the same name as Kwando farther up. Maheni's village is generally on the same bank as we were, but just now this part of the country was depopulated, owing to the presence of a man-eating lion. He had eaten several natives, and one night tried to abstract one of the sleeping porters from our camp. As a consequence, all the inhabitants had moved either across, or into the marshy islands, of the river. But of course the cultivated lands of the villagers were still in their old position, and, to show you how childish the natives are, the women refused to come over to cultivate the fields unless accompanied by two men with guns, regardless of the fact that both the



GETTING DONKEYS OVER RIVER.

guns were broken, and that there was not a single charge of powder or lead in the whole district.

Arrived opposite Maheni's, we turned sharply to the west, left the high ground, and with much wading arrived near the river's bank. Maheni soon came over to visit us. He was one of the best natives I have ever met—a youngish man of perhaps thirty-five, kind, straightforward, and obliging, and above all outspoken and truthful. In answer to our request to be taken across the river, he said he had two canoes which were at our disposal, and would take our men and goods across, but he urged that he had never seen donkeys before, and that, though he would do his best to cross them safely, we must not hold him responsible for accidents. True to his word, the next morning

arrived with his men and canoes, and a few hours' hard work landed everything on the far side. Nothing got wet, except myself, for I managed to overbalance a canoe I was in, and though the donkeys had a long swim, and a still longer march through swamps up to their bellies, they all arrived safely at the village. When all were over, and the canoes returned to fetch Maheni, my friend, and myself, Maheni stepped forward, and, shaking each boatman by the hand, thanked them warmly for the trouble and care they had taken. I certainly think I may couple Maheni with Khama, the Bechuana chief, as two notable examples of nature's gentlemen.

From Maheni's we went away on a fortnight's shooting trip about 7 or 8 miles north-west, where we enjoyed excellent sport with rhinoceros and other big game. The configuration of the country hereabouts was most peculiar. Five shallow valleys, nearly parallel with one another, ran east and west, varying in distance apart from 1 to 3 miles. Each was from a quarter to half a mile wide, was free from trees and almost from bush, and contained numerous vleys of water along the line of lowest level. They were separated from one another by sand-belts covered with forest. The two northern ones did not extend far to the west of our position; the two southern ones seemed to extend some distance westwards, while the central one was the most distinctly defined, and, if followed many miles to the west, led, the natives told me, to a large lake full of reeds and hippopotami, evidently the Okavango marshes. I hardly know whether to regard these five valleys as so many distinct channels down which at different times a river has flowed; but I am inclined rather to think that the central one alone represents the old river-bed, while those on either side of it formed rather a sort of delta, as one sees at the mouth of so many rivers, where it debouched into the Cuando near Maheni's village.

Returning to Maheni's, we left there on August 5, on our way back to Kazungula by the right or south bank of the Linyanti river. A march of about 50 miles in a south-south-easterly direction brought us to Salishand's village. On the way we passed a few Makuba villages. The country we traversed was flat, open, and parklike, and a good deal of it near the river was inundated; but, although there was no marked rise anywhere in elevation, the floods did not extend any great distance to the west, and the amount of forest and undergrowth showed that we were really well above water-level in most places.

Arrived at Salishand's, we found him away, but his wife advised us to halt the night, as there was an awkward river to cross in front, and she promised to send for her husband to come to help us. It is the only case I have met with where an African woman has ever come forward in our dealings with natives. As a rule, they keep at a respectful distance and refrain from giving any information. Perhaps Mrs. Salishand represents the rising generation of ladies in search of woman's

rights. I should certainly not be surprised if her next visitor finds her clothed in a pair of breeches—a second-hand pair of which I regret I did not supply her with.

Salishand, another very fair specimen of a native, on his return led us away for some 2 or 3 miles in a westerly direction, and brought us to the banks of the Magwegena spruit. This spruit, or river, Salishand informed me, led into, or higher up was known as, the Njo—I could not quite understand which meaning he intended to convey. He further told me that canoes could go from his village the whole distance to Lake Ngami. Strangely enough, I find that, in the map published with Anderson's 'Lake Ngami' in 1856, the river Dzo is marked as bordering the Okavango marshes on the east. This becomes the Machabe river lower down, and flows into the Tamalakan river, which in its turn enters the Botletlie just east of Lake Ngami, but whether these details are correct I am unable to say.

After continuing our journey for 5 or 6 miles south, we came to a couple of small Makuba villages, near the south-western corner of the Linyanti marshes. Here we turned sharply to the east, but soon left the river, which trended away northwards, and struck due east through the forest for some 3 miles, when we reached the Sunta, an affluent or effluent of the Linyanti, as you may please to regard it. No doubt at certain times it carries water into the big river; just now the big river was overflowing, and its waters were flowing up the Sunta.

After striking the Sunta we followed up its course for about 5 miles, when we reached its waters' end and crossed dryshod. Striking north-west, we arrived back at the Linyanti, and following its banks for about 45 miles we found ourselves again near Mameli's village, but separated from it, of course, by the river. We had to keep close along the river's edge, as the banks were high and clothed with thick, almost impenetrable bush. Leaving Mameli's drift, and making a slight *détour* through the bush for 7 miles, we then struck the river again. Here it turned away north of east, and we found ourselves in open but well-wooded country, through which we marched for a couple of days, when we again approached the river, which had turned and was running southwards. Separating us from it was an enormous area of high reeds. We were back again at Li-tlaka, or rather on its western edge. Thence we travelled about east for a few miles, when we reached the range of stony hills which, as I have said, stretches all the way to Kazungula. The open country we had been travelling through is called Baraka-rangwe. Twenty miles from here in a north-easterly direction along the foot of this range, brought us opposite to Ngoma village, and thenceforward we followed our old route back to Kazungula.

And now to deal briefly with the geographical and ethnographical results of the trip.

The instruments which I had with me for determining the positions

of various places were a 6-inch sextant, an astronomical telescope, and two half-chronometer watches with Greenwich time. Before leaving Buluwayo I was enabled to get the error of my watches on Greenwich time by signal from Cape Town; but, unfortunately, on my return to Buluwayo the wires had been destroyed by the Boers, and I had therefore to wait until I arrived in London before I could again get Greenwich time. I was, however, successful in observing stellar occultations on July 21, August 16, and September 17, and thereby to compute with very fair accuracy the rates of my watches. As a result, I fixed the following positions:—

Maheni's village ...	...	...	lat. 17° 52' 6" S., long. 23° 19' 22" E.
Salishand's village ...	...	...	„ 18° 30' 0" S., „ 23° 30' 45" E.
Mameli's village ...	...	...	„ 18° 5' 8" S., „ 24° 0' 9" E.
Ngoma ...	...	...	„ 17° 51' 10" S., „ 24° 40' 15" E.
Kazungula ...	...	...	„ 17° 46' 40" S., „ 25° 11' 15" E.

The country from Kazungula westwards, along the north side of the river, is inhabited by Basubia as far as a point slightly west of Mameli's. Westwards again from this, and still on the north side of the river, come the Baheyi. Mameli is the head chief of the Basubia of this district, and Maheni of the Baheyi; but most of the more important villages have Barotse headmen appointed by Lewanika himself. The villagers pay tithes to their headmen, and the latter, after presumably deducting a percentage, hand them over to indunas sent down by Lewanika to collect them. These tithes or taxes consist chiefly of skins, such as pookoo and lechwee and situtunga among the antelopes, jackals, and various species of herpestes or mungoose among the smaller mammals. Most of the headmen own a few cows, although these, I believe, are really the property of Lewanika, who allows the headmen to retain the milk and butter and a small percentage of the calves, as remuneration. No fowls are kept by either tribe, and eggs or chickens are therefore unobtainable, except at Mameli's village, where we saw pigeons and heard cocks crow, though we were unable to purchase either. The principal diet of both tribes is corn and fish, eked out by an occasional buck. The women and children, of course, do all the cultivation, and therefore the man who can buy most wives and has most children is the one who can till most land, and so soon becomes the most wealthy and important. The people are quiet and inoffensive, but shy. The majority live under shelters of grass which they call huts, but in the principal villages the houses are more substantial.

Periodically, what one may almost term slave-raids are made by the Barotse chiefs from Lialui, when young men and girls are carried off to become their serfs and wives. In Batokaland, to the north-east of Kazungula, this has been carried to such an extent that you can see no one in the villages but worn-out old people and infants. The Basubia and Baheyi are wilder by habit, and shyer, and consequently

these slave-raids are not so successful. Force, too, is not infrequently used on both sides, and this the Barotse do not like. I am glad to say that this question is receiving the deep attention of the officials of the British South African Company. Although both the Basubia and Baheyi understand and speak Serotse, they each have also their own language. They, however, not infrequently intermarry.

Roughly speaking, the whole of the right bank of the river from Maheni's to Kazungula may be said to be uninhabited. It is true that from Maheni's to the south-west corner of the swamp, just beyond Salishand's, there are a few villages. The inhabitants of these are emigrants from the north bank—not, as a rule, originally from pleasure



BUSHMAN'S CAMP.

but because of the slave-raids I have mentioned. They are called Bakuba by the Bechuana, Baheyi by the Barotse. They owe a divided allegiance, or rather they have to pay taxes both to Lewanika and to Sekhomi, the chief of Lake Ngami. Living in this district, but away back from the river, are the Bampukush, who own allegiance to Lebebe of Andarra. They trade with the Bakuba, and are often to be found near their villages, but they fly into the bush at the first whisper of the arrival of a Barotse. The Bampukush are good hunters, and very plucky; some eight or ten of them will even spoor up to a rhinoceros while asleep, and spear him, after which they follow him for miles, stabbing him as opportunity occurs, until at length they kill him. Among the Bampukush are a few nomad bushmen, the lowest of

the low. All along the south side of the Linyanti, from the Sunta to Kazungula, the country is absolutely uninhabited, though the natives from the north side visit it occasionally to take game by pitfalls or traps.

And now to deal with the geography of the district. Anything like an accurate survey of the river is impossible without a lengthened sojourn and a free use either of canoes or, better still, of a small steam-launch, on which to traverse and explore the various arms and branches. And even then it must be remembered that what appears to be an island to-day is part of the main land in a few months' time, when the floods have subsided. These floods occur twice annually—the one in January, February, and March, caused by the rains; the second in July, August, and September, caused no one at present knows how, though Mr. Arnot has offered a very probable explanation in a letter published in the *Geographical Journal* for March, 1900, to which I refer you. But, be the cause what it may, an overflow not only of the river Linyanti, but of the Okavango also, takes place in the middle of the driest season of the whole year. At this time, not only does the Linyanti come down in flood and fill up its own swamps, but the Okavango actually overflows down the Njo or Magwegena into the Linyanti. Evidently, then, the level of the Okavango is above that of the Linyanti. This dry-season overflow does not, as a rule, affect the Linyanti below Mameli's, but in certain years it can be seen as far as the village of Ngoma. The natives unanimously agreed that the inundations were decreasing in volume, and were not nearly so large as formerly; but, of course, it may be only that their minds are impressed with recollections of occasional years of great overflow which they have known in the past, and which do not happen to have recurred recently. I, however, saw disused dams erected to catch fish, and also quantities of shells of water-snails far away from the river, where I was told the water never came now. Again, Dr. Livingstone, in 1853, mentions that in lat. $18^{\circ} 4' 27''$, long. $24^{\circ} 6' 20''$, he came to the Sanshureh river, a branch or loop of the Linyanti, and found it an impassable barrier, with the whole country between it and the latter flooded. Selous, in 1874, speaks of the district as an island, yet I was able to traverse the whole of it dryshod, and had only one or two small pieces of shallow water to cross, which represented the Sanshureh in 1899. It is improbable, though still possible, that 1853 and 1874 were years of heavy overflow; but, looking at the fact that the floods of 1853 were larger than of 1874, and those of 1874 larger than those of 1899, it does seem likely that there is a regular and persistent decrease in the volume of water. The only evidence against it—and this is really only negative—is that some twenty years ago the Kashanga was very full. Of course, twenty years is a long time, but evidently in that year there was a very high dry-season flood.

As to the regular wet-season inundation, I could obtain no direct

evidence of its volume now as compared with former years. Dr. Livingstone, however, does say that between the Sebuba rapids and Kazungula the country between the Zambezi and Linyanti is split up into numerous islands: while to-day there is, I believe, only one island, and that the triangular piece of land that runs actually down to the confluence of the two rivers. It must be remembered that the dry season flood has never reached so far, and therefore the change in the aspect of the country there must be owing to diminished wet-season volume of water.

Before I leave the subject of the geography of this district, let me quote the remarks which Baines, the well-known explorer, makes in



CROSSING SWAMP.

reference to the name Chobe, under which the Linyanti river appears in most maps. He says, "Erroneously called Chobe, Chobe being merely a petty headman living on it, as Zouga, who seems now to be forgotten, did on the Botletli." And yet the Zouga, like the Chobe, is still on the maps, although Baines discovered the mistake so long ago as 1862.

The fauna of the district is represented by numerous animals. The elephant is now nearly extinct; the rhinoceros is not to be found east of Maheni's. Buffaloes and most sorts of antelopes have been sadly thinned by the visitation of rinderpest in 1896. Lions are plentiful, but rarely seen; hyenas, wild dogs, and the smaller mammalia are

common. Birds are in great numbers and variety. The quantity of guineafowl and francolins in some places along the south bank surpasses all imagination. With the decrease in the larger game, the tsetse fly has practically vanished, and while I saw millions in 1895, in 1899 we saw only some half-dozen, and the majority of these were away to the west of Maheni's.

A last remark as to the name to be applied to the country. Major Gibbons in his recent paper stated that the word Barotse as representing the ruling tribe did not exist, and that Marutse and Marutseland should be substituted. I can only say that Dr. Livingstone, than whom there can be no higher authority, speaks of them as Barotse. Selous the same. Mr. George Westbeeck, who had lived for twenty years among them, and was actually an induna or headman of the nation, I knew well in 1885 and 1888. He always called them Barotse. One of Westbeeck's old Hottentot hunters still living at Kazungula does the same. The language of the tribe is Sesuto, and in Sesuto language, as in Sechuana, Ba is the personal pronoun plural signifying "they." The people who speak Sechuana are the Bechuana, the people who speak Sesuto are the Basuto, the people who speak Serotse, and who are a branch of the Basuto, are the Barotse. I think the evidence I have adduced is sufficient to prove that Barotseland is the correct way of designating the country.

Prof. J. W. Gregory, making some remarks at the conclusion of Major Gibbons' paper, said that he had formed a theory as to the origin of the Victoria falls, but to be perfect it required evidence of a much larger flow of water than now occurred. Many years ago Livingstone formulated the theory of large pre-historic lakes in the district. He says, "The whole country between this (the Victoria falls) and the ridge beyond Libebe westwards—Lake Ngami and the Zouga southwards—and eastwards beyond Nchokotsa was one fresh-water lake."

I think no one who knows the country, no one who sees how even to-day the water-systems of the Okavango and the Linyanti are united, and no one who has wondered at the great Makari-kari salt lakes, can doubt the probable correctness of this theory. Whether the volume of water in this huge lake, bursting its way eastwards, would fulfil the requirements of Prof. Gregory's theory, I do not know; but without doubt it must make almost certain the former connection of the Okavango and Linyanti rivers. For as this lake emptied, the flow of water must necessarily have scored channels in what was then its bottom, but is now dry land. And these channels must have been cut approximately from west to east. We find even to-day the Magwegena still in existence, and still carrying some of the Okavango waters into the Linyanti; and further north, as I have told you, are the old river-valleys near Maheni's, which, there is little doubt, at one time carried still more of the Okavango, and more directly too, into the Linyanti.

These then were probably connecting channels, cut, as I have suggested, by the flow of the diminishing waters of the lake. Whether the natural changes which have altered them from permanent streams into the condition they are in to-day, are prehistoric or comparatively recent, I am unable to surmise. And all the evidence that I have been able to obtain (and at best it is second-hand) is contained in a statement in Baines's 'Explorations in South-West Africa,' published in 1864, where he states, on the authority of C. J. Anderson, that Libebe informed the latter that the Makalolo under Sekeletu, when they made a raid on Libebe, came all the way from Linyanti in canoes. So that there was water connection of some sort in those days. But even without this evidence, the existing connection by the Magwegena, coupled with the undoubted drying up of all this portion of Africa, as has been noticed by every traveller since Livingstone's time, does indubitably point to a far more complete connection in even comparatively recent dates. The subject is to me a most interesting one, and if any remarks which I have made to-night should act as an inducement to any one to go and study the question scientifically on the spot, I confess I shall be more pleased.

Before the reading of the paper, the Chairman, Sir T. H. HOLDICH, Vice-President, said: Once more I appear before you as I fear a most inefficient substitute for our President, who is unavoidably absent. To-night we have to turn our attention once again to Central Africa. Mr. Reid will take us into the little-known regions of Linyanti.

After the reading of the paper, the following discussion took place:—

Major GIBBONS: Mr. Reid has thrown down the gauntlet to me in no unmeasured terms. I hope, however, to prove to his satisfaction before I sit down that he has not got such a good case as he appeared to have. First of all, I must set him right on the question as to who the Marotse are. He seems to think they are in some way mixed up with the Basutos; that is not the case at all. I have taken a very considerable interest in this matter, spent a great deal of time in Marotseland, and have traced their history back for the last 250 years. Before that they came from the Kabompo, presumably *en route* from the north. But there is a link between the Basutos and the Marotse, although they have not a particle of blood in common. I think, if Mr. Reid had read Livingstone's or M. Coillard's book, or even my own, he would have found that the Makololo, an offshoot of the Basutos, worked their way through the desert, and settled, first of all, in the very country he has been talking about to-night. They arrived there in about 1828, and about 1840 went up into Burotse, and conquered the Marotse. In 1864 they were absolutely wiped out almost to a man—one or two escaped, and, with the exception of one or two women, there was no Makololo blood left in the country. So much for the blood relationship. Now as regards the language. The difference between the Marotse and the Basuto language is about the same as the difference between chalk and cheese—there is no connection between them. Livingstone calls these invaders *Makololo*, and Mr. Reid himself calls them *Makololo*, thus his rule falls to the ground on his own showing. Now as regards *Sekololo*, the language spoken, which was introduced by the Makololo, and is used, generally speaking, by all the upper Zambezi river tribes at the present time. I have a list of witnesses to prove my contention, most of whom, curiously enough, have been cited by Mr. Reid in

support of his theory. I have had talks on this subject with many of the chiefs. From Lewanika I took a list with paper and pencil of every tribe in his country through an interpreter, and he tells me the people are Marotse, and the country Burotse. I may tell you Marotse is the name given by the Makololo—previously they were known as Aälui. As regards M. Coillard, I talked to him on the subject, and he told me most definitely that what I tell you is right. I said, "Why did you call them Barotse in your book?" He said, "They are generally known as Barotse in Europe; it is for explorers, and not missionaries, to make such corrections." In connection with that, I wrote to M. Jalla, who had been there eleven years, and asked his opinion. He writes back, "By all means—speaking of these people—the 'Ba' should be given up, and the 'Ma' used. The Basutos never use 'Ma' unless they see a large crowd together. But at the High Zambezi it is not so, and they call the people Marotse." Now, we may take that also to be M. Coillard's view, especially as he has given a very good reason why he uses "Ba" in his book. But Mr. Reid quotes Selous. I wrote to him and asked his opinion. He used Barotse. He says, "My opinion"—he speaks very frankly—"my opinion as to whether it is correct to call them Marotse or Barotse is of no value; indeed, I hold no opinion on the subject, as I never made inquiries. If Lewanika and M. Coillard say the correct name is Marotse, no doubt it is so." Then, as regards Mr. George Westbeeck, the same thing applies to him as to the missionary. They use Barotse to white men, but Marotse in native conversation. Personally, I always used to do so myself, but I would not like to bring myself as a witness against myself. As regards Livingstone—that is Mr. Reid's only strong point on the subject—we must take into consideration the fact that when Livingstone was there, it was in the reign of the Makololo, and the Marotse were a subject tribe. Livingstone was almost entirely associated with the Makololo, so I do not lay any special emphasis on the fact of his spelling the word Barotse. Mind you, nobody can have a higher opinion of the value of Livingstone's work than I have. I have passed over much of his route, and have seen traces of his conscientiousness throughout; on his work I have known as a rule where I am going to be next, and I cannot say that of everybody. I think we must acknowledge that Livingstone's strong point was not in his naming. As Mr. Reid says, the name Chobe, which Livingstone used of the lower Kwando or Linyanti, should be wiped out of the map, and I quite agree with Mr. Reid on that subject.

I really do not know that I can say anything more. I have produced every particle of evidence save one. Major Coryndon, who has administered the country for four years, quite agrees with me. I submit, therefore, as a counter-proposition to Mr. Reid's, that the people should be Marotse, and the country Burotse. Referring to the two floods of the Linyanti, possibly my experience may throw a little light on that subject. I preceded Mr. Reid, crossing the river a few miles south; then cutting across to the Okavango, I met its waters overflowing down the Magwekwana bed. I can vouch that the overflow took place on April 14, as I had to wade for three and a half days through the water knee-deep. As regards this theory of the two floods in the Linyanti, it is obvious the one in January, February, March must occur as the result of the local rain. The whole of the Kwando is under very similar conditions, in the matter of the rain-supply, as other rivers in Marotseland. While Mr. Reid was there, I had one of my men at the source, and another was following it up to where I was, and at any rate as late as August there was no fresh rainfall on the Kwando, so we can assume that the second flood is independent of Kwando. About 700 or 800 miles above the overflow the Kwito valley is some 2 miles wide, and held a lot of water at the end of June, and there is an inconceivable amount of water held up in the Magwekwana swamps. This

must take some time to drain off, because the river is not like the Zambezi, with a large bed. My idea is that the overflow should occur through May and June, and should continue to drain off for another two or three months. The fact of that water coming into the Kwando would in itself affect the current for some distance up-stream, because the Kwando is not a quick-flowing river at all, and the floods below would hold up the water above just as a bar of rocks or other obstruction would. I think the river would be affected as far up as Mr. Reid was, though of course the current would not be reversed. Although I differ from Mr. Reid on one point, I must say I listened to the paper with a great deal of satisfaction, and to one point especially, and I congratulate him on the result of his longitudinal observations. It has been a great satisfaction to me to see them, because I find that our relative positions between the points he fixed are within a mile of one another.

Major CORYNDON: I think Major Gibbons is quite right with regard to his prefix of the word to be applied to the people; but I think, under the circumstances, that the word Barotse has been used so long it will have to remain.

Mr. REID: If you will excuse me for one moment, I would like to say a few words in reply to the remarks made by Major Gibbons. As regards the name Barotseland, I do not think it is of importance. Of course I unhesitatingly accept the statement made by M. Coillard, backed up as it is by M. Jalla and Major Coryndon, that the name used now by the natives is Marotseland. But I have no doubt that what has occurred is this: When Dr. Livingstone visited the country it had been recently conquered by the Makololo, who imposed their language on the people, and as the Makololo were Basutos they would naturally use the term Barotseland. But since then the real Makololo have been entirely wiped out, and though their language still remains it is naturally tending to become impure, and so I think the prefix "Ba" has gradually been changed into "Ma," which is the usual one among the bulk of the tribes who go to make up the nation of to-day. As regards Major Gibbons's theory about the dry season overflow of the Linyanti marshes, what he says is that in his opinion this is not caused by the Kwando itself coming down in flood, but by the Okavango doing so and emptying its surplus waters into the Linyanti by the Magwegena river. But to my mind this is a physical impossibility. The Linyanti marshes cover an area of about 350 square miles. The Magwegena, as I saw it in flood, had an average width of some 30 feet, and a depth of some 5 feet. Its current I should calculate at about 2 miles per hour; but even if double this, it would take something like six months' continuous flow to raise the level of the water in the Linyanti marshes *by one foot*. Added to this is the fact that at Maheni's, where I crossed the Kwando, I saw it with my own eyes coming down in heavy flood with a rapid current of a good 4 miles per hour. And this was roughly some 50 miles above the real Linyanti marshes. Of course, when Major Gibbons crossed it some three months earlier it was not in flood, neither was the Magwegena until he got a considerable distance up its course, where he met the floods advancing on him almost like a wave. I have no doubt whatever that the greater bulk by far of the dry-season water in the Linyanti marshes comes down the Kwando itself. Where it comes from I cannot tell you.

The CHAIRMAN: In the present phase of African development, the unravelling of its geography is a matter of very great interest to us. Twenty-five years hence—if all of us live to see that day—we shall find the district of the Linyanti is a well-known hunting-ground, and the route between Khartum and Fashoda almost as well known as the route to-day between London and Cairo.* It seems to

* At the same meeting, the paper on "A Survey of the Sobat Region," by Major Austin, published in the May number of the *Journal*.

me it is the infinite possibilities, the extraordinary variety, of the unsolved problems which lie hidden in Africa and form its chief attraction, and it is to men like Mr. Reid and Major Austin that the happy chances of unravelling these mysteries are coming, and it is for you to say whether they make good use of their opportunities. For my part, they seem to me to be the masters of the art of exploration, and I would call your attention to the map of Major Austin.* It seems to me to be a good specimen of the maps we nowadays ask for ; we are no longer content with the haphazard speculations of geography—we ask for good sound maps based on a fair number of fixed points. And here we have them, not only from Major Austin, but from a great number of travellers who wander through the length and breadth of Africa. We hope that the magnet of Africa may once more attract Mr. Reid, and that we shall hear something more from him and from Major Austin in the future as to the possibilities of that great country. Meanwhile, I will ask you all to join me in according a cordial vote of thanks to Mr. Reid for what I am sure you will agree with me is the most graphic and realistic record of African travel.

THE ANGLO-SAXONS OF THE KENTUCKY MOUNTAINS : A STUDY IN ANTHROPOGEOGRAPHY.

By Miss ELLEN CHURCHILL SEMPLE.

IN one of the most progressive and productive countries of the world, and in that section of the country which has had its civilization and its wealth longest, we find a large area where the people are still living the frontier life of the backwoods, where the civilization is that of the eighteenth century, where the people speak the English of Shakespeare's time, where the large majority of the inhabitants have never seen a steamboat or a railroad, where money is as scarce as in colonial days, and all trade is barter. It is the great upheaved mass of the Southern Appalachians which, with the conserving power of the mountains, has caused these conditions to survive, carrying a bit of the eighteenth century intact over into this strongly contrasted twentieth century, and presenting an anachronism all the more marked because found in the heart of the bustling, money-making, novelty-loving United States. These conditions are to be found throughout the broad belt of the Southern Appalachians, but nowhere in such purity or covering so large an area as in the mountain region of Kentucky.

A mountain system is usually marked by a central crest, but the Appalachians are distinguished by a central zone of depression, flanked on the east by the Appalachian mountains proper, and on the west by the Alleghany and the Cumberland plateaus. This central trough is generally designated as the Great Appalachian Valley. It is depressed several hundred feet below the highlands on either side, but its surface is relieved by intermittent series of even-crested ridges which rise 1000 feet or more above the general level, running parallel to each other, and conforming at the same time to the structural axis of the

* See p. 572.

whole system. The valleys between them owe neither width nor form to the streams which drain them. The Cumberland plateau forms the western highland of the Great Valley in Eastern Kentucky, Tennessee, and Northern Alabama. This plateau belt reaches its greatest height in Kentucky, and slopes gradually from this section to the south and west. Its eastern escarpment rises abruptly 800 to 1500 feet from the Great Valley, and shows everywhere an almost perfectly straight skyline. The western escarpment is very irregular, for the streams, flowing westward from the plateau, have carved out their valleys far back into the elevated district, leaving narrow spurs running out into the low plains beyond. The surface is highly dissected, presenting a maize of gorge-like valleys separating the steep, regular slopes of the sharp or rounded hills. The level of the originally upheaved mass of the plateau is now represented by the altitude of the existing summits, which show a remarkable uniformity in the north-east—south-west line, and a slight rise in elevation from the western margin towards the interior.

About 10,000 square miles of the Cumberland plateau fall within the confines of the state of Kentucky, and form the eastern section of the state. A glance at the topographical map of the region shows the country to be devoted by nature to isolation and poverty. The eastern rim of the plateau is formed by Pine mountain, which raises its solid wall with level top in silhouette against the sky, and shows only one water-gap in a distance of 150 miles. And just beyond is the twin range of the Cumberland. Hence no railroads have attempted to cross this double border-barrier, except at the north-east and south-east corners of the state, where the Big Sandy and Cumberland rivers have carved their way through the mountains to the west. Railroads, therefore, skirt this upland region, but nowhere penetrate it. The whole area is a coalfield, the mineral being chiefly bituminous, with several thousand square miles of superior cannel coal. The obstructions growing out of the topography of the country, and the cheap river transportation afforded by the Ohio for the Kanawha and Monogahela river coal have tended to retard the construction of railroads within the mountains, and even those on the margin of this upland region have been built since 1880.

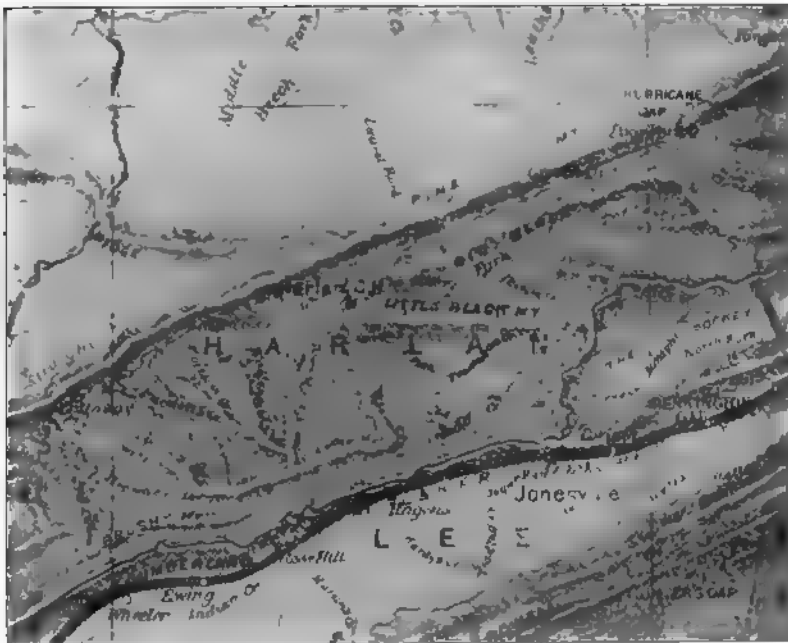
Man has done so little to render this district accessible because nature has done so little. There are here no large streams penetrating the heart of the mountains, as in Tennessee, where the Tennessee river, drawing its tributaries from the easternmost ranges of the Appalachians, cuts westward by flaring water-gaps through chain after chain and opens a highway from the interior of the system to the plains of the Mississippi. The Kentucky streams are navigable only to the margin of the plateau, and therefore leave this great area without natural means of communication with the outside world to

the west, while to the east the mountain wall has acted as an effective barrier to communication with the Atlantic seaboard. Consequently, all commerce has been kept at arms' length, and the lack of a market has occasioned the poverty of the people, which, in turn, has prohibited the construction of high-roads over the mountains of the Cumberland plateau.

It is what the mountaineers themselves call a rough country. The steep hills rise from 700 to 1200 feet above their valleys. The valleys are nothing more than gorges. Level land there is none, and roads there are almost none. Valley and road and mountain stream coincide. In the summer the dry or half-dry beds of the streams serve as highways; and in the winter, when the torrents are pouring a full tide down the hollows, foot trails cut through the dense forest that mantles the slopes are the only means of communication. Then intercourse is practically cut off. Even in the best season transportation is in the main limited to what a horse can carry on its back beside its rider. In a trip of 350 miles through the mountains, we met only one wheel vehicle and a few trucks for hauling railroad ties, which were being gotten out of the forests. Our own camp waggon, though carrying only light loads, had to double their teams in climbing the ridges. All that had been done in most cases to make a road over a mountain was to clear an avenue through the dense growth of timber, so that it proved, as a rule, to be just short of impassable. For this reason the public of the mountains prefer to keep to the valleys with their streams, to which they have given many expressive and picturesque names, while the knobs and mountains are rarely honoured with a name. We have Cutshin creek, Hell-fer-Sartain, Bullskin creek, Poor Fork, Stinking, Greasy, and Quicksand creek. One trail leads from the waters of Kingdom-Come down Lost creek and Troublesome, across the Upper Devil and Lower Devil to Hell creek. *Facilis decensus Averno*, only no progress is easy in these mountains. The creek, therefore, points the highway, and is used to designate geographical locations. When we would inquire our way to a certain point, the answer was, "Go ahead to the fork of the creek, and turn up the left branch," not the fork of the road and the path to the left. A woman at whose cabin we lunched one day said, "My man and me has been living here on Quicksand only ten years. I was born up on Troublesome."

All passenger travel is on horseback. The important part which the horse plays, therefore, in the economy of the mountain family recalls pioneer days. Almost every cabin has its blacksmith's forge under an open shed or in a low outhouse. The country stores at the forks or fords of the creek keep bellows in stock. Every mountaineer is his own blacksmith, and though he works with very simple implements, he knows a few fundamental principles of the art, and does the work well. Men and women are quite at home in the saddle. The men are

superb horsemen, sit their animals firm and erect, even when mounted on top of the meal-bag, which is the regular accompaniment of the horseman. We saw one day a family on their way to the country store to exchange their produce. The father, a girl, and a large bag of Indian corn were mounted on one mule, and the mother, a younger girl, and a black lamb suspended in a sack from the saddle-bow on the other. It is no unusual thing to see a woman on horseback, with a child behind her and a baby in her arms, while she holds an umbrella above them.



MAP SHOWING THE CONTRAST BETWEEN THE VALLEY OF THE POOR FORK IN KENTUCKY AND THE VALLEY OF POWELL'S RIVER IN VIRGINIA.

But such travel is not easy, and hence we find that these Kentucky mountaineers are not only cut off from the outside world, but they are separated from each other. Each is confined to his own locality, and finds his little world within a radius of a few miles from his cabin. There are many men in these mountains who have never seen a town, or even the poor village that constitutes their county-seat. Those who have obtained a glimpse of civilization have gone down the headwaters of the streams on lumber rafts, or have been sent to the state penitentiary at Frankfort for illicit distilling or feud murder. The women, however, cannot enjoy either of these privileges; they are almost as rooted as the trees. We met one woman who, during the

twelve years of her married life, had lived only 10 miles across the mountain from her old home, but had never in this time been back home to visit her mother and father. Another back in Perry county told us she had never been farther from home than Hazard, the county-seat, which was only 6 miles distant. Another had never been to the post-office, 4 miles away; and another had never seen the ford of the Rockcastle river, only 2 miles from her home, and marked, moreover, by the country store of the district.

A result of this confinement to one locality is the absence of anything like social life, and the close intermarriage of families inhabiting one district. These two phenomena appear side by side here as in the upland valleys of Switzerland and other mountain countries where communication is difficult. One can travel for 40 miles along one of the head streams of the Kentucky river and find the same names recurring in all the cabins along both its shores. One woman in Perry county told us she was related to everybody up and down the North Fork of the Kentucky and along its tributary creeks. In Breathitt county, an old judge, whose family had been among the early settlers on Troublesome, stated that in the district school near by there were ninety-six children, of whom all but five were related to himself or his wife. This extensive intermarriage stimulates the clan instinct and contributes to the strength of the feuds which rage here from time to time.

It is a law of biology that an isolating environment operates for the preservation of a type by excluding all intermixture which would obliterate distinguishing characteristics. In these isolated communities, therefore, we find the purest Anglo-Saxon stock in all the United States. They are the direct descendants of the early Virginia and North Carolina immigrants, and bear about them in their speech and ideas the marks of their ancestry as plainly as if they had disembarked from their eighteenth-century vessel but yesterday. The stock is chiefly English and Scotch-Irish, with scarcely a trace of foreign admixture. Occasionally one comes across a French name, which points to a strain of Huguenot blood from over the mountains in North Carolina; or names of the Germans who came down the pioneer thoroughfare of the Great Appalachian Valley from the Pennsylvania Dutch settlements generations ago. But the stock has been kept free from the tide of foreign immigrants which has been pouring in recent years into the States. In the border counties of the district where the railroads run, and where English capital has bought up the mines in the vicinity, the last census shows a few foreign-born, but these are chiefly Italian labourers working on the road-bed, or British capitalists and employees. Four of the interior counties have not a single foreign-born, and eight others have only two or three.

Though these mountain people are the exponents of a retarded

civilization, and show the degenerate symptoms of an arrested development, their stock is as good as any in the country. They formed a part of the same tide of pioneers which crossed the mountains to people the young states to the south-west, but they chanced to turn aside from the main stream, and ever since have stagnated in these mountain hollows. For example, over a hundred years ago eleven Combs brothers, related to General Combs of the Revolutionary army, came over the mountains from North Carolina. Nine of them settled along the North



LANDSCAPE IN A MARGINAL COUNTY.

Fork of the Kentucky river in the mountains of Perry county, one went further down the stream into the rough hill country of Breathitt county, and the eleventh continued on his way till he came into the smiling regions of the Bluegrass, and there became the progenitor of a family which represents the blue blood of the state, with all the aristocratic instincts of the old South; while their cousins in the mountain go barefoot, herd in one-room cabins, and are ignorant of many of the fundamental decencies of life.

If the mountains have kept out foreign elements, still more effectually have they excluded the negroes. This region is as free from them as northern Vermont. There is no place for the negro in the mountain economy, and never has been. In the days of slavery this fact had momentous results. The mountains did not offer conditions for plantation cultivation, the only system of agriculture in which slaves could be profitably employed. The absence of these conditions and of the capital wherewith to purchase negroes made the whole Appalachian region a non-slave-holding section. Hence, when the rupture came between the North and South, this mountain region declared for the Union, and thus raised a barrier of disaffection through the centre of the Southern States. It had no sympathy with the industrial system of the South; it shared the democratic spirit characteristic of all mountain people, and likewise their conservatism, which holds to the established order. Having, therefore, no intimate knowledge of the negro, our Kentucky mountaineers do not show the deep-seated prejudice to the social equality of blacks and whites which characterizes all other Kentuckians. We find to-day, on the western margin of the Cumberland plateau, a flourishing college for the co-education of the Bluegrass blacks and mountain whites; and this is probably the only geographical location south of the Mason and Dixon line where such an institution could exist.

Though the mountaineer comes of such vigorous stock as the Anglo-Saxons, he has retained little of the ruddy, vigorous appearance of his forebears. The men are tall and lank, though sinewy, with thin bony faces, sallow skins, and dull hair. They hold themselves in a loose-jointed way; their shoulders droop in walking and sitting. Their faces are immobile, often inscrutable, but never stupid; for one is sure that under this calm exterior the mountaineer is doing a deal of thinking, which he does not see fit to share with the "furriner," as he calls every one coming from the outside world. The faces of the women are always delicately moulded and refined, with an expression of dumb patience telling of the heavy burden which life has laid upon them. They are absolutely simple, natural, and their child-like unconsciousness of self points to their long residence away from the gaze of the world. Their manners are gentle, gracious, and unembarrassed, so that in talking with them one forgets their bare feet, ragged clothes, and crass ignorance, and in his heart bows anew to the inextinguishable excellence of the Anglo-Saxon race.

The lot of a mountain woman is a hard one. Only the lowest peasantry of Europe can show anything to parallel it. She marries between twelve and fifteen years a husband who is between seventeen and twenty. The motive in marriage is very elemental, betrays little of the romantic spirit. Husband and wife speak of each other as "my man" and "my woman." A girl when she is twenty is put on the

"cull list," that is, she is no longer marriageable. A man is included in this undesirable category at twenty-eight; after that he can get no one to take him "except some poor wider-woman," as one mountain matron expressed it, adding, "gals on the cull-list spend their time jes' bummin' around among their folks." During a ride of 350 miles, with visits at a great many cabins, we met only one old maid; her lot was a sorry one, living now with a relative, now with a friend, earning her board by helping to nurse the sick or making herself useful in what way she could. The mountain system of economy does not take into account the unmarried woman, so she plunges into matrimony with the instinct of



A BIT OF LEVEL LAND.

self-preservation. Then come children; and the mountain families conform to the standard of the patriarchs. A family of from ten to fifteen offspring is no rarity, and this characterizes not only the mountains of Kentucky, but the whole area of the Appalachian system. In addition to much child-bearing, all the work of the pioneer home, the spinning and weaving, knitting of stockings, sometimes even the making of shoes and moccasins, falls on the woman. More than this, she feeds and milks the cow, searches for it when it has wandered away "in the range," or forest, hoes weeds in the corn, helps in the ploughing, carries water from the spring, saws wood and lays "stake and ridged" fences. A mountain woman who had a husband and two sons, and who had been employed all day in making a fence, lifting the heavy rails above the height of her own head, replied in a listless way to the question as to

what the men did, with, "the men folks they mostly sets on a fence and chaw tobacco and talk politics."

The mountain woman, therefore, at twenty-five looks forty, and at forty looks twenty years older than her husband. But none of the race are stalwart and healthy. The lack of vigour in the men is due chiefly to the inordinate use of moonshine whiskey, which contains 20 per cent. more alcohol than the standard liquor. They begin drinking as mere boys. We saw several youths of seventeen intoxicated, and some women told us boys of fourteen or fifteen drank. Men, women, and children looked underfed, ill nourished. This is due in part to their scanty, unvaried diet, but more perhaps to the vile cooking. The bread is either half-baked soda biscuits eaten hot, or corn-pone with lumps of saleratus through it. The meat is always swimming in grease, and the eggs are always fried. The effect of this shows, in the adults, in their sallow complexions and spare forms; in the children, in pimples, boils, and sores on their hands and faces. This western side of the mountains, moreover, has not an abundant water-supply, the horizontal strata of the rocks reducing the number of springs. Hence all the mountain region of Kentucky, West Virginia, and Tennessee shows a high percentage of diarrhoeal diseases, typhoid, and malarial fever.

The home of the mountaineer is primitive in the extreme, a survival of pioneer architecture, and the only type distinctly American. It is the blind or windowless one-room log cabin, with the rough stone chimney on the outside. The logs are sometimes squared with the hatchet, sometimes left in their original form with the bark on; the interstices are chinked in with clay. The roofs are covered with boards nearly an inch thick and 3 feet long, split from the wood by a wedge, and laid on, one lapping over the other like shingles. The chimneys, which are built on the outside of the houses, and project a few feet above the roof, lend a picturesque effect to the whole. They are made of native rock, roughly hewn and cemented with clay; but the very poorest cabins have the low "stick chimney," made of laths daubed with clay. In the broader valleys, where the conditions of life are somewhat better, the double cabin prevails—two cabins side by side, with a roofed space between, which serves as a dining-room during the warmer months of the year. Sometimes, though rarely, there is a porch in front, covered by an extension of the sloping roof. In some of the marginal counties of the mountain region and in the sawmill districts, one sees a few two-story frame dwellings. These are decorated with ornamental trimming of scroll-saw work in wood, oftentimes coloured a light blue, along the edges of the gables, and defining the line between the two stories. The regulation balcony over the front door and extending to the roof has a balustrade of the same woodwork in excellent, chaste design, sometimes painted and sometimes in the natural colour. These houses, both in their architecture and style of ornamentation,

recall the village dwellings in Norway, though not so beautiful or so richly decorated. But the usual home of the mountaineer is the one-room cabin. Near by is the barn, a small square log structure, with the roof projecting from 8 to 10 feet, to afford shelter for the young cattle or serve as a milking-shed. These vividly recall the mountain architecture of some of the Alpine dwellings of Switzerland and Bavaria, especially when, as in a few instances, the roofs are held down by weight-rocks to economize hardware. Very few of them have hay-lofts above, for the reason that only a few favoured districts in these mountains produce hay.

The furnishings of the cabins are reduced to the merest necessities



THE PROBLEM OF TRANSPORTATION.

of life, though in the vicinity of the railroads or along the main streams where the valley roads make transportation a simpler problem, a few luxuries like an occasional piece of shop-made furniture and lamp-chimneys have crept in. One cabin which we visited near the foot of Pine mountain, though of the better sort, may be taken as typical. Almost everything it contained was home-made, and only one iron-bound bucket showed the use of hardware. Both rooms contained two double beds. These were made of plain white wood, and were roped across from side through auger-holes to support the mattresses. The lower one of these was stuffed with corn-shucks, the upper one with feathers from the geese raised by the housewife. The sheets, blankets, and counterpanes had all been woven by her, as also the linsy-wolsey from which her own and her children's clothes were made. Gourds,

hung on the walls, served as receptacles for salt, soda, and other kitchen supplies. The meal-barrel was a section of log, hollowed out with great nicety till the wood was not more than an inch thick. The flour-barrel was a large firkin, the parts held in place by hoops, fastened by an arrowhead at one end of the withe slipped into a slit in the other; the churn was made in the same way, and in neither was there nail or screw. The washtub was a trough hollowed out of a log. A large basket was woven of hickory slips by the mountaineer himself, and two smaller ones, made of the cane of the broom corn and bound at the edges with coloured calico, were the handiwork of his wife. Only the iron stove with its few utensils, and some table knives, testified to any connection with the outside world. The old flint-lock gun and powder-horn hanging from a rafter gave the finishing touch of local colour to this typical pioneer home. Daniel Boone's first cabin in the Kentucky wilderness could not have been more primitive.

Some or most of these features can be found in all mountain homes. Some cabins are still provided with hand-mills for grinding their corn when the water-mills cease to run in a dry summer. Clay lamps of classic design, in which grease is burned with a floating wick, are still to be met with; and the manufactured product from the country store is guiltless of chimney. Every cabin has its spinning-wheel, and the end of the "shed-room" is usually occupied by a hand-loom. Only in rare cases is there any effort to beautify these mountain homes. Paper flowers, made from old newspaper, a woodcut from some periodical, and a gaudy advertisement distributed by an itinerant vendor of patent medicines, make up the interior decoration of a cabin. Sometimes the walls are entirely papered with newspapers, which are more eagerly sought for this purpose than for their literary contents. Material for exterior decoration is more accessible to the mountain housewife, and hence we find, where her work-burdened life will permit, that she has done all she can for her front yard. Poppies, phlox, hollyhock, altheas, and dahlias lift their many-coloured blooms above the rail fence. Over the porch, where there is one, climb morning-glory, sweet potato vines, and wild mountain ivy; and from the edge of the roof are suspended home-made hanging baskets, contrived from old tin cans, buckets, or anything that will hold soil, and filled with the various ferns and creepers which the forest furnish in great beauty and abundance.

A vegetable garden is always to be found at the side or rear of the cabin. This is never large, even for a big family. It is ploughed in the spring by the man of the household, and enriched by manure from the barn, being the only part of the whole farm to receive any fertilizer. Any subsequent ploughing and all weeding and cultivation of the vegetables is done by the women. The average mountain garden will yield potatoes, beets, cabbages, onions, pumpkins, and tomatoes of dwarf size. Beans are raised in considerable quantities and dried for winter

use. The provisions for the luxuries of life are few. Adjoining every garden is a small patch of tobacco, which is raised only for home consumption. It is consumed, moreover, by both sexes, old and young, and particularly by the women, who both smoke and "dip" snuff, making the brush for the dipping from the twig of the althea. In a large gathering like a funeral, one can often see girls from twelve to fourteen years old smoking their clay or corn-cob pipes. A young woman who went through the mountains last summer to study the conditions for a social settlement there, found the children at a district school amusing themselves by trying to see who could spit tobacco-juice nearest a certain mark on the school-house wall, the teacher standing by and watching the proceeding with interest.



MOUNTAIN HOME WHERE THE BALLAD OF "BARBARA ALLEN" WAS PRESERVED BY TRADITION.

Sugar is never seen in this district, but backwoods substitutes for it abound. Almost every cabin has its beehives, and anywhere from ten to twenty. The hives are made from hollowed-out sections of the bee-gum tree, covered with a square board, which is kept in place by a large stone. The bees feed in the early spring on the blossoms of the yellow poplar, but in the western counties, where this tree is rapidly being cut out of the forest for lumber, honey is no longer so abundant. But the mountain region, as a whole, produces large amounts of honey and wax. Pike county, on the Virginia border, produced over 60,000 lbs. of honey in 1890. Maple sugar is gotten in considerable quantities from the sugar maple, which abounds. As one rides through the forests, he sees here and there the rough little log troughs at the base of these trees, the bit of cane run into the hole bored through the bark for the sap, and at long intervals a log sugar-house with its huge cauldron for reducing the syrup. Maple sugar

is used only as a sweetmeat. The mountaineer puts his main reliance for sweetening on sorghum molasses, which he makes from the sorghum cane. Two acres of this will provide an average mountain household with sorghum molasses, or "long sweetening," for a year. They eat it with their "pone" bread and beans; coffee thus sweetened they drink with relish, though to the palate of the uninitiated it is a dose. Sugar, or "short sweetening," is a rarity.

Conditions point to agriculture as the only means for the Kentucky mountaineer to gain a livelihood. Mineral wealth exists in abundance in this section, but the lack of transportation facilities prevents its exploitation; so the rough hillsides must be converted into field and pasture. The mountaineer holds his land in fee simple, or by squatter claim. This is based, not upon title, but merely on the right of possession, which is regarded, moreover, as a thoroughly valid basis in a country which still preserves its frontier character. Large tracts of Kentucky mountain lands are owned by persons outside the state, by purchase or inheritance of original pioneer patents, and these are waiting for the railroads to come into the country, when they hope to realize on the timber and mines. In the mean time the mountaineers have been squatting on the territory for years, clearing the forests, selling the timber, and this with conscious impunity, for interference with them is dangerous in the extreme. Every lawyer from the outside world who comes up here to a county courthouse to examine titles to the land about, keeps his mission as secret as possible, and having accomplished it, leaves the town immediately. If further investigation is necessary, he does not find it safe to return himself, but sends a substitute who will not be recognized.

The pioneer character of the region is still evident in the size of the land-holdings. In the most mountainous parts near the eastern borderline the farms average from 160 to 320 acres; in the western part of the plateau, from 100 to 160 acres. Of the whole state, the mountain counties show by far the largest proportion of farms of 1000 acres and over. Pike county has sixty-six such. Mountaineers in two different sections told us that the land on the small side creeks was better, and there farms averaged about 200 acres; but that on main streams, like the North Fork of the Kentucky river and Poor Fork of the Cumberland, the farms were usually 600 acres, because the soil was poorer. The cause for this was not apparent, unless it was due to exhaustion of soil from long tilling, as the valleys of the main streams, being more accessible, were probably the earliest settled.

Only from thirteen to thirty per cent. of the acreage of the farms is improved; the rest is in forest or pasture. Land is cleared for cultivation in the old Indian method by "girdling" or "deadening" the trees, and the first crop is planted amidst the still standing skeletons of ancient giants of the forests. Indian corn is the chief crop raised, and

furnishes the main food-supply for man and beast. Great fields of it cover the steep mountain sides to the very top, except where a farmer, less energetic or more intelligent than his fellows, has left a crown of timber on the summit to diminish the evil of washing. The soil on the slopes is thin, and in the narrow V-shaped valleys there is almost no opportunity for the accumulation of alluvial soil. Hence the yield of corn is only from ten to twelve bushels to an acre, only one-third that in the rich Bluegrass lands of Central Kentucky. But population is so sparse that the harvest generally averages forty bushels *per capita*. In these "upright" farms all ploughing is done horizontally around the face of the mountain, but even then the damage from



AN "UPRIGHT" FARM; STICK-AND-CLAY CHIMNEY.

washing is very great, especially as the staple crop forms no network of roots to hold the soil and requires repeated ploughing. In consequence, after two successive crops of corn the hillside is often quite denuded, the soil having been washed away from the underlying rocks. The field then reverts to a state of nature, growing up in weeds and briars, and furnishing a scanty pasturage for cattle. Level land is very scarce, and is to be found only in the long serpentines of the main streams; but even here, from long cultivation and lack of fertilizers, a field is exhausted by two crops, and has to "rest" every

third year. Clover is almost never seen. The mountaineers maintain it will not grow here, although on our circuit we did see two fields.

Of other cereals beside corn the yield is very small. Some oats are raised; but rye, wheat, barley, and buckwheat are only occasionally found. One or two rows of broom-corn provide each cabin with its material for brooms. Sometimes a small quantity of hay, poor in quality, is cut from a fallow-field for winter use. The yield in all the crops is small, because the method of agriculture employed is essentially extensive. The labour applied is small, limited to what is possible for a man and his family, generally, too, the feminine part of it, because his sons found their own families at an early age. It is almost impossible to hire extra labourers, because this element of the population, small at best, finds more profitable and steadier employment in various forms of lumber industry. The agricultural implements used are few, and in general very simple, except in the vicinity of the railroad. In remote districts the "bull-tongue" plough is in vogue. This primitive implement is hardly more than a sharpened stick with a metal rim; but as the foot is very narrow, it slips between the numerous rocks in the soil, and is therefore adapted to the conditions. Natives in two different sections told us that "folks fur back in the mountains" resort to something still simpler—a plough which is nothing but a fork of a tree, the long arm forming the beam, and the shorter one the foot.

The mountains of Kentucky, like other upland regions, are better adapted to stock farming; but, as the native has not yet learned the wisdom of putting his hillside in grass to prevent washing, and at the same time to provide pasturage, the stock wanders at will in the "range" or forest. There sheep thrive best. They feed on the peavine, which grows wild in the dense woods, but will not grow on cultivated land. One native explained that the sheep liked the "range," because they could take refuge from winter storms and the intense noonday heat of summer in "the stone houses." In answer to the inquiry whether he constructed such houses, he answered with the characteristic reverence of the mountaineer, "No; God made 'em. They're God's houses—just caves or shelter places under ledges of rock." About half of the mountain sheep are Merino and English breeds, but they have deteriorated under the rough conditions obtaining there. While the average yield per fleece for the whole state of Kentucky is over 4 lbs. of wool, for the mountain counties it is only 2 lbs., and in some localities drops to $1\frac{1}{3}$ lb. These sheep are naturally a hardy stock, and are often bought up by farmers from the lowlands, taken down to the Bluegrass and fattened for a few months, and sold at a profit.

Sheep are the only product of the mountain farm that can find their way to an outside market and do not suffer from the prevailing lack of

means of transportation. In regard to everything else, the effort of the native farmer is paralyzed by the want of a market. If he fattens his hogs with his superfluous corn, they are unfit to carry their own weight over the 40 or 50 miles of rough roads to the nearest railroad, or they arrive in an emaciated condition. So he contents himself with his "razor-back" pigs, which climb the hills with the activity of goats and feed with the turkeys on the abundant mast in the forests. Cattle also are raised only for home use. Steers are used pretty generally for ploughing, and especially for hauling logs. Every cabin has one cow, occasionally more. These can be seen anywhere browsing along the



A CABIN OF THE BETTER SORT.

edge of the road, where the clearing has encouraged the grass. In the late summer they feed greedily on "crap grass," or Japan clover (*Lespedeza striata*), which springs up wherever there is a patch of sunlight in the forest. Knowing that dairy products are natural staples in almost all mountain countries of the world, as we penetrated into this district we made constant inquiries in regard to cheese, but everywhere found it conspicuous by its absence. However, on our returning to civilization, the census reports on mountain industries revealed the surprising fact that just one county, in the south-western part of the district and on the railroad, was cheese-producing, and that it made 6374 lbs. in 1889. The mystery was explained on referring to the

statistics of population, which showed that this county harboured a Swiss colony of 600 souls. In the state of West Virginia, also, where the topography of the country is a repetition of that of eastern Kentucky, no cheese is produced; but, on the other hand, considerable quantities are made in all the mountain counties of Tennessee and Virginia. These states, again, are alike in having, as their geographical structure, the broader inter-montane valleys between the chain-like linear ranges of the Great Appalachian depression. In 1889, Lee County, Virginia, produced 8595 lbs. of cheese; while just over Cumberland mountain, which forms its western border, Bell County, Kentucky, produced not an ounce.

In spite of the hard conditions of life, the Kentucky mountaineer is attached to this rough country of his. Comparatively few emigrate, and many of them come back, either from love of the mountains or because the seclusion of their previous environment has unfitted them to cope with the rush and enterprise of life in the lowlands. One mountaineer told us that, though it was a poor country, "the men mostly stays here." Another who had travelled much through the district in his occupation of selecting white oak timber for a lumber company, estimated that about one man in five emigrated; such generally go to Missouri, Arkansas, and Texas. We met several who had been out West, but the mountains had drawn them back home again. The large majority of the population, therefore, stay in their own valley, or "cove," as they call it, divide up the farm, and live on smaller and smaller estates, while the cornfields creep steadily up the mountains. The population of these twenty-eight counties with their 10,000 square miles area was about 220,000 in 1880, or over twenty to the square mile; that in 1890 was 270,000, showing an increase of 25 per cent. As the ratio in the past decade has risen, there is now a population of 340,000, or thirty-four to the square mile, while for the state at large the ratio is fifty-four. This growth of population is to be attributed almost entirely to natural increase; and as the accessions from the outside are practically limited to the foreign element, only two or three thousand all told, employed in the coal-mines and on the railroads, so large a percentage of increase precludes the possibility of much emigration. Cities there are none, and the villages are few, small, and wretched. This is true also of the county-seats, which, in the interior counties, average only from 300 to 400 souls; while those of the marginal counties and located on railroads encircling the mountain districts sometimes rise to 1500, but this is rare.

In consequence of his remoteness from a market, the industries of the mountaineer are limited. Nature holds him in a vice here. As we have seen, a few of his sheep may find their way to the railroad, but his hogs are debarred by the mountains from becoming articles of commerce. The same is true of his corn, which is his only superabundant

crop; and this, therefore, by a natural economic law, the mountaineer is led to convert into a form having less bulk and greater value. He makes moonshine whisky, and not all the revenue officers of the country have succeeded in suppressing this industry. At our first camping-place, only 15 miles from the railroad, we were told there were twenty illicit stills within a radius of 5 miles. Two women, moreover, were pointed out to us who carried on the forbidden industry; their husbands had been killed in feuds, so they continued to operate the stills to support their families. Living so far from the arm of the law, the mountaineer assumes with characteristic independence that he has a right to utilize his raw material as he finds expedient.



A MOUNTAIN FAMILY.

He thinks it laudable to evade the law—an opinion which is shared by his fellows, who are ready to aid and abet him. He therefore sets up his still in some remote gorge, overhung by trees and thickly grown with underbrush, or in some cave whose entrance is effectually screened by boulders or the dense growth of the forest, and makes his moonshine whisky, while he leaves a brother or partner on guard outside to give warning if revenue officers attempt a raid. It is a brave man who will serve as deputy marshal in one of these mountain counties, for raiding a still means a battle, and the mountaineers, like all backwoodsmen, are fine marksmen. In Breathitt County, called "Bloody Breathitt," four deputy marshals have been killed in the past six months. The moonshiner fully understands the penalty for illicit distilling, and if he is caught, he takes his punishment like a philosopher—all the more as there is no opprobrium attached in his community to a term in the penitentiary for this crime. The disgrace falls upon the one who gave testimony against the illicit distiller; and often a

mountaineer, if summoned as a witness in such a case, leaves his county till the trial is over, rather than appear for the prosecution. Most of the moonshine is sold within the mountains. The natives, physically depressed by lack of nourishment and by the prevalent diseases of the district, crave stimulants; so the demand for spirits is steady. Not content with the already excessive strength of moonshine whisky, they often add pepper or wood-ashes to make it more fiery. The result is maddened brains when under its influence, and eventually ruined constitutions.

Forests of magnificent timber cover the Kentucky mountains, and supply the only industry which brings any considerable money from the outside world, because the only one which can utilize the small, rapid streams for transportation. The steep-sided valleys are productive of valuable hardwood timber. Many varieties of oak, walnut, poplar, chestnut, maple, ash, and tulip trees grow to magnificent size. Log-rolling begins in the fall after the Indian corn harvest, and continues through the winter till March. The logs are deposited along the banks of the streams to wait till a "tide" or sudden rise supplies enough water to move them. Sometimes, where a creek or "branch" is too small to carry its prospective burden, the loggers build across it a "splash dam," behind which logs and water accumulate to the requisite point, and then the barrier is knocked loose, when tide and timber go rushing down the channel. On the main streams of the Kentucky, Big Sandy, Licking, and Cumberland, the logs are rafted and floated down to the saw-mills in the lowlands. All the headwaters of these rivers are marked out to the traveller through the mountains by the lumber stranded from the last "tide" and strewn along their banks.

Some of the wood within a day's hauling of the railway is worked up in a form ready for commerce, but generally with great waste of good material. The fine chestnut oaks are cut down in large quantities simply to peel off tan-bark, while the lumber is left to rot. Railroad ties are cut and shaped in the mountains from the oak and hauled to the railroad. The making of staves of white oak for whisky-barrels is also a considerable industry. The trees are sawed across the length of the stave, and split by wedges into billets, which are then hollowed out and trimmed into shape. This last process is performed by an implement run sometimes by steam, generally by horse-power, for in the latter form it is more readily transported over the rough mountain roads from place to place, as the supply of white oak is exhausted. These staves bring \$32.00 a thousand delivered at the railroad. The mountain labourer working at stave-making or at the portable saw-mills earns 75 cents a day, while the usual wages for farm hands in this district are only 50 cents.

The trades in the mountains are the primitive ones of a pioneer

community—cobbler, blacksmith, and miller; but even these elemental industries have not been everywhere differentiated. Many a cabin has its own hand-mill for grinding corn when the water-mill is too remote. Many a native still makes moccasins of calf or raccoon skin for himself and his family to spare the more expensive shoes; and it is a poor sort of mountaineer who cannot and does not shoe his own horses and steers. Here is reproduced the independence of the pioneer home. Spinning and weaving survives as an industry of the women. In some



A MOUNTAIN CHURCH.

few localities one can still see the flax in every stage, from the green growth in the field to the finished homespun in 100-yard pieces; or, again, one sees a cotton patch in the garden, a simple primitive gin of home invention for separating the fibre, and understands the origin of the cotton thread in the linsey-woolsey cloth of domestic manufacture which furnishes the dresses for women and children. Cotton and flax spinning, however, have died out greatly during the past few years, since the introduction of cheap cotton goods into the mountain districts.

Spinning of woollen yarn for stockings is still universal, with the concomitant arts of carding and dyeing ; while the weaving of linsey-woolsey for clothes or blankets is an accomplishment of almost every mountain woman. One native housewife showed us her store of blankets, woven by her mother and herself. They were made in intricate plaids of original design and combination of colour, and the owner told us she worked without a pattern and without counting the threads, trusting to her eye for accuracy. Many of the dyes, too, she made herself from certain trees, though a few she bought at the country store. The home-woven counterpanes are very interesting, because the designs for these have been handed down from generation to generation, and are the same that the Pilgrim Fathers brought over to New England. But the mountain woman puts forth her best taste and greatest energy in making quilts. In travelling through this section one looks out for some expression of the æsthetic feeling as one finds it in the wood-carving of the Alps and Scandinavian mountains, the metal-work of the Caucasus, the Cashmere shawls of the Himalayas, and the beautiful blankets of the Chilcat Indians. Gradually it is borne in upon him that quilt-making amounts to a passion among the women of the Kentucky mountains ; that it does not merely answer a physical need, but is a mode of expression for their artistic sense ; and there is something pathetic in the thought. They buy the calico for the purpose, and make their patchwork in very intricate designs, apparently getting their hints from their own flower-gardens ; at any rate, the colours in certain common garden flowers were reproduced in some quilts we saw, and the effect was daring but artistic. Quilt-making fills the long leisure hours of the winter, and the result shows on the open shelves or cupboard which occupies a corner in every house. Passing a one-room cabin on the headwaters of the Kentucky river, we counted seventeen quilts sunning out on the fence.

The only work of the women which brings money into the family treasury is searching for ginseng, or "sang-pickin'," as the mountaineer calls it. This root is found now only in the wildest, most inaccessible ravines ; but the women go out on their search barefoot amid the thick brush and briars, taking their dogs along to keep off the rattlesnakes. They also gather "yellow root" (*Hydrastis canadensis*), which with the ginseng (*Panax quinquefolium*) they dry and then barter for produce at the nearest store, the former at the rate of 40 cents per pound, the latter at 3 dollars. Most of the trade in the mountains is barter, for money is as scarce as in genuine pioneer countries, and the people are accordingly unfamiliar with it. A native who came over the mountains from some remote cove to sell eggs to a camping party this past summer, was offered a dollar bill for his produce, but refused to accept it, as he had never seen one before, his experience having been limited to silver dollars and small change. At another place we found that the people

were reluctant to take the paper currency of the issue of 1892, anything so recent having not yet penetrated into their fastnesses. But the lack of money does not prevent them from being eager traders, especially in horseflesh. One of the attractions of Sunday church-going to the men is the opportunity it offers for this purpose. A glance at one of these little mountain churches when meeting is going on reveals the fitness of the occasion. The people have gathered from every direction for miles around; they have come on their best horse, and now every tree on the edge of the clearing has become a hitching-post. Groups form outside before and after the service, satisfying their social craving, and, with the few topics of conversation at their command, talk naturally drifts upon the subject of their "beasties," with the inevitable result of some trading. Their trading propensity carries them so far that they often trade farms as they would horses, no deeds being executed.

As the isolation of his environment has left its stamp upon every phase of the outer life of the mountaineer, so it has laid its impress deep upon his inner nature. The remoteness of their scattered dwellings from each other and from the big world beyond the natural barriers, and the necessary self-reliance of their pioneer-like existence, has bred in them

an intense spirit of independence which shows itself in many ways. It shows itself in their calm ignoring of the revenue laws, and in their adhering to the principle of the blood-feuds which inculcates the duty of personal vengeance for a wrong. In consequence of this spirit of independence, and of its antecedent cause in their slight dealings with men, our Kentucky mountaineers have only a semi-developed commercial conscience. They do not appreciate the full moral force of a contract; on this point they have the same vague ideas that most women have, and from the same cause. At all times very restive under orders, when they have taken employment under a superior, their service must be politely requested, not demanded. If



MOUNTAIN TYPES.

offended, they throw up their job in a moment, and go off regardless of their contract and of the inconvenience they may occasion their employer. Every man is accustomed to be his own master, to do his own work in his own way and his own time. And this brings us to another curious characteristic of the mountaineer, also an effect of his isolation. He has little sense of the value of time. If he promises to do a certain thing on a certain date, his conscience is quite satisfied if he does it within three or four days after the appointed time. For instance, some mountaineers had promised to furnish horses for our camping party, which was to start from a certain village on July 15; when that day came half a dozen horses had failed to appear, but their places were supplied and the party moved off. During the succeeding week, delinquent mountaineers dribbled into town with their horses, and were surprised to find they were too late, explaining that they did not think a few days would make any difference.

Living so far from the rush of the world, these highlanders have in their manner the repose of the eternal hills. In the presence of strangers they are quite free from self-consciousness, and never lose their simplicity or directness. There is no veneer about these men; they say exactly what they think, and they think vigorously and shrewdly. Endowed with the keen powers of observation of the woodsman, and cut off from books, they are led to search themselves for the explanation of phenomena or the solution of problems. Though hampered by ignorance, their intellects are natively strong and acute. Conscious of their natural ability, conscious too that they are behind the times, these people are painfully sensitive to criticism. Cut off so long and so completely, they have never been able to compare themselves with others, and now they find comparison odious. They resent the coming of "fur-riners" among them, on the ground that outsiders come to spy upon them and criticize, and "tell-tale," as they put it, unless they are convinced that it is some commercial mission or a political campaign that brings the stranger. His suspicions allayed, the mountaineer is the most generous host in the world. "Strangers, won't you light and set? Hitch your beasties. This is a rough country, and I'm a poor man, but you can have all I've got." This is the usual greeting. If it is a question of spending the night, the host and his wife sleep on the floor and give the guests the bed. In a one-room cabin, the entertainment of strangers involves inconvenience, but this discomfort is never considered by the Kentucky highlander. When he says, "You can have everything I've got," this is no lip-service. At one cabin where we spent the night, when we were making our toilettes in the morning, the daughter of the house, with infinite grace and simplicity, offered us the family comb and her own tooth-brush. Hospitality can go no further. This quality the Kentucky mountaineer has in common with the inhabitants of all remote, untrodden regions where inns are rare.

But if he refuses to be reimbursed for his outlay and trouble, he is repaid in part by the news which the stranger brings, and the guest is expected to be very communicative. He must tell everything he has seen or heard on his journey through the mountains, and must meet a whole volley of questions of a strictly personal nature. Inquiries come as to his age, married or unmarried condition and the wherefore, his health, ailments, symptoms, and remedies.

The mountaineer has a circumscribed horizon of interests; he is little stirred by the great issues of the day, except those of a political nature, and for politics he has a passion. A discussion of party platforms or rival candidates for office will at any time enthrall him.



HAND-LOOM AND SPINNING-WHEEL FOR FLAX.

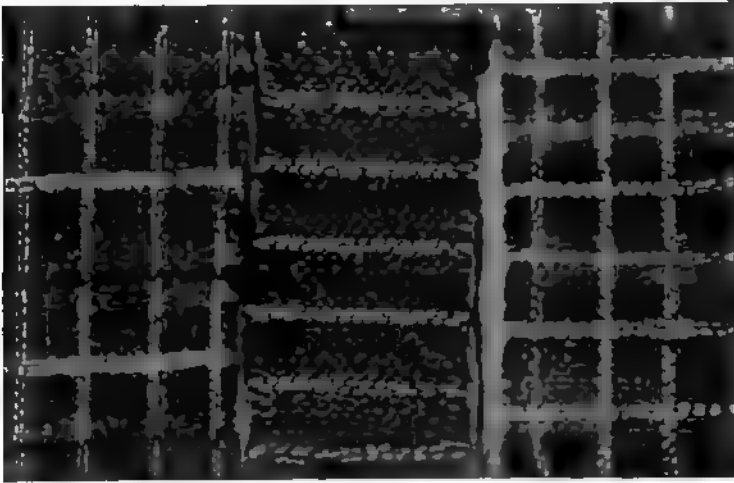
keep him away for a whole day from the spring ploughing or sowing. As we have explained, since the mountains presented conditions for agriculture as little adapted for a slave industrial system as did those of New England, when the conflict of the systems of the North and of the South came to an issue in the Civil War, the mountain sections of the southern states took the side of New England, and went over almost bodily into the Republican party. Such was their zeal for the Union, that some of the mountain counties of Kentucky contributed a larger quota of troops, in proportion to their population, for the Federal army than any other counties in the Union. The enthusiasm of those days survives in that section to-day in their staunch adherence to the

Republican party. The spirit has been encouraged also by the fact that topography has defined the mountain section as one of the political divisions of the State by a kind of common law of both political parties in their conventions and in common parlance. Although more sparsely populated than any of the others, the mountain division, from its greater local unity, is relatively much stronger in party conventions, since its delegate vote is more likely to be a unit. In consequence of this fact, it is sure to get a fair proportion of its men as candidates upon the State ticket, and its party vote can be counted upon with considerable accuracy. Knowing, therefore, that they are a strong factor in the politics of the State, it is not surprising that the Kentucky mountaineers should find therein a great interest.

Men who, from the isolation of their environment, receive few impressions, are likely to retain these impressions in indelible outline; time neither modifies nor obliterates them. Thus it is with the Kentucky mountaineer. He never forgets either a slight or a kindness. He is a good lover and a good hater; his emotions are strong, his passions few but irresistible; because his feelings lack a variety of objects on which to expend themselves, they pour their full tide into one or two channels and cut these channels deep. Like all mountain-dwellers, they love their home. They love the established order of things. Their remoteness from the world's great current of new ideas has bred in them an intense conservatism, often amounting to bitter intolerance. For instance, they were so outraged by the divided skirts and cross-saddle riding of some of the women of our party, that in one county they were on the point of blocking our way; in another, they were only dissuaded from a raid on the camp by a plea from a leading man of the town for the two Kentucky women of the party who used side-saddles, and everywhere they gave scowling evidence of disapproval. There were no jeers; the matter was to them too serious for banter or ridicule. Nor was their feeling, as we shall see later, an outgrowth of a particularly high and delicate standard of womanhood; it was more a deep-seated dislike of the unusual. Painfully lax in many questions of morals, they hold tenaciously to matters of form. The women who came into our camp at different times to visit us, in spite of a temperature of 90° Fahr., wore red woollen mitts, their tribute to the conventions.

The upland regions of all countries are the stronghold of religious faiths, because the conservatism there bred holds to the orthodox, while the impressive beauty and grandeur of the natural surroundings appeals to the spiritual in man. Such a religion, however, is likely to be elemental in character—intense as to feeling, tenacious of dogma, but exercising little or no influence on the morals of everyday life. This is the religion of the Kentucky mountaineer. By nature he is reverential. Caves are "God's houses," sun time is "God's time,"

indicated by the noon-mark traced with charcoal on the cabin door. A God-fearing man has the unlimited respect of every one in the mountains. A preacher is a privileged person. Wherever he goes he finds free board and lodging for himself and his horse, and his horse is always shod free. In that lawless country, a man who shoots a preacher is ever after an object of aversion, and there is a general assumption that the murderer will not live long—either a superstition or a generalization from the experience that often some individual constitutes himself an arm of the Almighty to punish the offender. One who is a preacher must be "called" to the work, and must serve without pay. The "call" does not presuppose any previous preparation for the profession, and naturally involves some modern substitute



MOUNTAIN TEXTILES.

for Paul's tent-making to earn a livelihood. The result in the Kentucky mountains is sometimes amazing. Preachers there have been known to be whisky distillers. Some have been seen to take one or two drinks of liquor while delivering a sermon. We attended an outdoor "meetin'" conducted by one whose widowed sister ran a moonshine still. The best are farmers or country storekeepers. All are more or less ignorant, some densely so. We heard one man preach who could neither read nor write. At a meeting of some sectarian association in the fall of 1898, a mountain preacher advanced the opinion that the old blueback spelling-book gave all the education that a preacher needed. The style of preaching that appeals to the mountaineer is purely hortatory. It begins in a natural tone of voice, but, like all highly emotional speech, soon rises to rhythmical cadences, and then settles to a sustained chant for an hour or more. Any explanatory remarks

are inserted parenthetically in a natural voice. This, and only this, stirs the religious fervour of the mountaineer. A clergyman from one of our cities who was doing missionary work among these people was met with the criticism after his service, "Stranger, I 'lowed to hear ye preach, and ye jest talked."

Though his religion is emotional and little suggestive of a basis in rationalism, yet the mountaineer takes his mental gymnastics in vigorous discussion of dogma. This seems to be the one form of abstract reasoning open to him—an exercise natural to the Teutonic mind. He is ignorant, remember, therefore positive and prone to distinguish many shades of belief. Sects are numerous. There are four recognized kinds of Baptists in the mountains. Denominational prejudice is so strong that each denomination refuses to have anything to do with another. A Methodist refuses to send his children to the Presbyterian mission school in his neighbourhood, though it is far superior to anything else at his command, and costs him nothing. For this reason the work of the various Home Mission boards in the mountains has achieved only limited results as to number. Only undenominational work, like that of a social settlement, can reach all the people of one locality; and in view of the sparsity of the population, this is a vital matter.

In spite of the intensity of religious feeling, the number of communicants of all denominations forms only from five to fifteen per cent. of the total population. The mountains of Eastern Kentucky show the largest area of this low percentage in the United States, east of the Missouri river and the Indian territory. It may be due to the lack of churches and of any church organization where the preachers are "called" and do not form a distinct profession. Baptists, Disciples of Christ, and Methodists are most profusely represented. The sparsity of population with the diversity of sects permits religious service only once a month, when the circuit rider comes. This devoted man leaves his farm or store on Friday, and goes "creeter-back" over the mountains to each of his distant charges in turn. The district school building, in lieu of a church, answers for the meeting. Service is held on Saturday morning, and again on Sunday, for many of the congregation have come such a distance they feel entitled to a double feast of religion. They stay at the nearest cabin, which takes them in with their horses. After the Saturday sermon, the secular affairs of the church are attended to, as the mountaineer considers it unseemly to transact any business, even the disciplining of a delinquent member, on Sunday, although outside the sacred precincts he trades horses and indulges his taste for conviviality. Religion is something to be kept assiduously apart from common everyday living.

The fact that the profession of a mountain preacher is only an avocation with its consequent secondary claim upon his time, the fact

of the severity of winter weather for horseback travel, and of the impassability of the roads at this season both for pastor and people, render church worship intermittent in this upland region, and at the same time explain the curious custom of the mountain funeral. This never takes place at the time of interment, but is postponed for months or years. It is desirable to have the ceremony at a time when the roads are passable, when the preacher will not be detained by the harvesting of his corn crop, and when there can be a great gathering of kinfolk, for the clan instinct is strong among these people, and a funeral has its cheerful side in the opportunity of social intercourse it affords. Sometimes a long arrear of funerals has to be observed, if adverse circumstances for several years have prevented a family gathering. At one cabin we visited, the woman of the house told us she was getting ready for a big gathering at her place on the first of October, when the funerals of five of her relatives were to be preached. A university man, travelling through the mountains to make some scientific research, told us he had recently heard a sermon preached in honour of an old man who had died a year before and of a baby girl who had departed this life in 1868. The prominence given to funeral sermons in the season of good roads lends a sombre cast to the religion of



HOMESPUN COUNTERPANES.

the mountaineer, and strengthens in him a fatalistic tendency which is already one of his prominent characteristics, born doubtless of the hopelessness of his struggle with natural conditions. This feeling is so strong that it goes to astonishing lengths. It frankly condemns missions and Sunday schools as gratuitous meddling with the affairs of Providence. An Episcopal bishop recently, on arriving in a mountain village, heard that one of the families there was in great distress, and went immediately to make a visit of condolence. When he inquired as to the cause of their grief, he learned that a ten-year-old son had disappeared the evening before, and they had reason to suppose he had been lost in a large limestone cave which ran back 2 miles under

the mountain not far away. In answer to his question if their search had been fruitless, he learned they had made no attempt at search, but "if he's to die, he's to die" came the wail, with pious ejaculations as to the will of God. In a few moments the man of God was striding along the trail to the cave, a posse of men and boys armed with candles and lanterns pressing close upon his heels, and in two hours the lost child was restored to the bosom of its family..

The morals of the mountain people lend strong evidence for the development theory of ethics. Their moral principles are a direct product of their environment, and are quite divorced from their religion, which is an imported product. The same conditions that have kept the ethnic type pure have kept the social phenomena primitive, with their natural concomitants of primitive ethics and primitive methods of social control. Such conditions have fostered the survival of the blood-feud among the Kentucky mountaineers. As an institution, it can be traced back to the idea of clan responsibility which held among their Anglo-Saxon forefathers; and it is this Old World spirit which animates them when the eldest man of a family considers it a point of honour to avenge a wrong done to one of his kindred, or when a woman lays upon her sons the sacred obligation of killing the murderer of their father. In a community that grows from within by natural increase, hereditary instincts are strong, and clan traditions hold sway. But if the blood-feud was decadent among the colonial ancestors of our Kentucky mountaineers, the isolation of this wild upland region was all-sufficient to effect its renascence, and to-day in some counties it is a more powerful factor of social control than the courts of law. The mountains, by reason of their inaccessibility and the sparsity of their populations, saw a great prolongation of pioneer days and pioneer organization of society, where every man depended on his own strong arm or rifle to guard his interests and right his wrongs. When the law invaded this remote region, it found the feud established and the individual loath to subordinate himself to the body politic. This individual was justified to himself by the almost universal miscarriage of justice. For the administration of the law is almost impossible in a feud case. It is next to impossible to convict a murderer in his own county, because the jury, and often the witnesses, are intimidated by the party of the defendant, and will fail to render a verdict of guilty; or, if the murder was committed to avenge some real wrong, the mountain jury, trained by tradition in their peculiar ideas of family honour, feels itself in sympathy with the criminal and acquits him. This they do without compunction, for they have as yet only a rudimentary conception of the sacredness of the law. The court often tries a change of venue, but the cost of this is particularly burdensome in a poor community, and the change is made to an adjoining county, where sympathy with mountain methods still holds. As a last resort, a rescue party of the defendant's

relatives will make its attempt to defeat justice. An episode of the Howard and Baker feud, which raged during the summer of 1899 in Clay County, was the trial in Knox County of a Baker lad who had killed one of the opposing faction. Forty-two Bakers, armed with rifles and smokeless powder, came over the mountains to attend the trial, and openly established their "fort," or headquarters, in the county-seat. The boy, though clearly guilty, was acquitted, received his gun from the sheriff, and started off that night to the scene of hostilities, attended by his kindred as a guard of honour, not as a rescue party. The consequence is, if a man is killed in a quarrel, his relatives, knowing from long experience the helplessness of the law, take the



HAND-MILL FOR GRINDING MAIZE.

matter of punishment into their own hands, and at their first chance shoot the murderer. But the desire for personal vengeance is always present. In this same Howard and Baker feud, Tom Baker shot to death William White, an ally of the Howards and brother of the sheriff, as likewise kinsman of the county clerk, jailer, and judge. Naturally reluctant to give himself up to officials who were his personal enemies, Baker took to the hills until State troops were sent to the county, when he gave himself up to them. They pitched tent in the court-house yard, with a Gatling gun in position for action, and Tom Baker was placed in a tent in the centre, while no one was allowed to enter military lines. But one day his guards brought Tom Baker

moment to the door of his tent for a breath of air, and in that instant a shot, fired from the house of the sheriff, found its way to his heart. And the mountaineers openly exulted that a hundred trained soldiers could not protect a man who had been marked out as a victim.

The exciting causes of these feuds are manifold and often of a trifling nature. A misunderstanding in a horse trade, a gate left open and trespassing cattle, the shooting of a dog, political rivalry, or a difficulty over a boundary fence may start the trouble. The first shooting is sometimes done in the madness of moonshine intoxication. These mountaineers are men who hold life as light as a laugh, and to such anything is sufficient provocation to shoot; so the first blood is easily shed. The feud once started, a long and bloody war ensues, often for several years, in which waylaying, shooting from ambush, and arson are regular features. Sometimes pitched battles, engaging a hundred men or more, or a protracted siege of a factionist stronghold varies the programme. In the recent Howard and Baker feud, the principals were men of prominence, influence, and means, so they were able to command a number of followers. The main allies of the Howards were the White family, who have furnished members of the United States Congress, State Senate, and House of Representatives, and have controlled the offices of the county for fifty years. In the French and Eversole feud, which raged at intervals for many years in Perry County, the best people of the county were drawn into one or the other faction. And yet throughout this section there are those who deplore the reigning lawlessness.

In all mountain regions of the world crimes against persons are far more frequent than crimes against property. So in the Kentucky uplands the former are frequent, the latter rare. There is no real disgrace attached to killing an enemy or a government officer who attempts to raid a moonshine still. There is little regard for the law as such, little regard for human life; but property is sacred. If a mountaineer is asked what, in the eyes of the mountain people, is the worst crime a man can commit, the answer comes, "Horse-stealing. If a man up here steals a horse, his best friend would not trust him again with fifty cents." Here speaks the utilitarian basis of his ethics in the almost impassable roads and trails of a pioneer country. To further inquiry he replies, "And the next worst thing is to steal logs out of a stream—indeed, to steal anything." The mountaineer is honest, scrupulously so. If a log from a lumber-camp is stranded on his field from a subsiding flood in the river, he rolls it into the water at the next rise; or if this is impossible on account of its weight, he lets it lie and rot as a matter of course, for it never occurs to him to cut it up for his own use. He never locks his door. If a robbery occurs, the punishment is swift and sure, for the hue-and-cry is raised up and down the valley or cove, and the escape of the culprit is almost

impossible. Primitive in their shortcomings, these mountain people are primitive also in their virtues. The survival of the clan instinct has bred in them a high degree of loyalty; and their free, wild life, together with the remoteness of the law, has made them personally brave. They carry themselves with a certain conscious dignity which peremptorily forbids all condescension. Every man recognizes man's equality; there are no different classes. The consequence is the prevalence of that democratic spirit which characterizes the mountains of Switzerland and Norway.

In only one respect do the mountain people show marked moral degradation. There seems to be no higher standard of morality for the women than for the men, and for both it is low. This is true throughout the Southern Appalachians. The women are modest, gentle, and refined in their manners, but their virtue is frail. The idealism of youth keeps the girls pure, but when they marry and take up the heavy burdens that mountain life imposes upon them, their existence is sunk in a gross materialism, to which their environment offers no counteracting influence. Furthermore, the one-room cabin harbours old and young, married and single, of both sexes.

The Kentucky mountaineers are shut off from the inspiration to higher living that is found in the world of books. Isolation, poverty, sparsity of population, and impassability of roads make an education difficult, if not impossible; the effect of these conditions is to be seen in the large percentage of illiterates in this section. Of the women over twenty-five years old and men over forty, 80 per cent. can neither read nor write. It is quite the usual thing to meet men of clear, vigorous intellects and marked capacity in practical affairs who cannot sign their own names. One mountaineer gave it as his observation that only one-half of the men over twenty years in his county could read. With the children it is somewhat better, because with the natural increase of population more district schools are established, and distances are therefore shortened for the tramp from cabin to school-house. To children who must go barefoot, or wear home-made moccasins, or who can afford not more than one pair of store shoes a year, the question of distances is a vital one, especially in the winter. The district schools are in session for five months, from August 1 till Christmas. The number of pupils at a school ranges from fifty to a hundred of all ages from six years to twenty, and all are in charge of one ignorant, often inexperienced teacher. All start in at their work in August, but it is soon interrupted for a week, because the instructor has to leave to attend the Teachers' Institute at the county-seat. On October 1 the older boys and girls are withdrawn from school for two weeks to help get in the harvest. Then November comes, and with it in alternative years certain important state and county elections. If the teacher is a man, being one of the few educated men of the section, he is

probably a candidate for one of the county offices, or a member of his always numerous family connection aspires to the State legislature. In either event the teacher, with a mountaineer's sense of the importance of politics, closes school for ten days before the election in order to take part in the campaign. The middle of November the little flock reassembles, and the work of education goes on. But soon the fall rains come, and then the cold and snows of December. First the youngest and frailest are kept at home, but the older and sturdier ones continue, all the more eagerly now because they have the undivided attention of their instructor. The day comes, however, when the intense cold, combined with their own sad want of stout shoes and warm clothes, keeps even the most ambitious at home, and the teacher, with a sigh of relief or regret, locks the school-house door two weeks before the term is over. And the children, with no books at home on which to exercise their attainments, lose almost all that they have gained. And that all is little at best.

The district school of the Kentucky mountains is, in general, a rough log-cabin more or less crudely equipped according to the sparsity or density of the surrounding population. Some are entirely without desks, rude, uncomfortable benches of rough mountain manufacture taking their places. We saw no maps, and instead of blackboards, the unplanned planks of the inside of the walls had been stained a dark colour for a space of 12 feet. In some of the back districts, where hardware is at a premium, the children are summoned from recess by a big wooden rattle. If the physical equipment of the school is primitive, the mental is almost as crude. The standard of education for the teachers is not high. Some of them have not progressed farther than the multiplication table in arithmetic, and all use ungrammatical English. Their preparation for teaching in general consists of the course of instruction at the district school and a few months' training at the so-called normal school of the county-seat. At a recent meeting of the Teachers' Institute in one of the mountain counties, when the subject up for discussion was "Devotional exercises in schools," it transpired that, of the fifty-six public school teachers present, only one in eight knew the Lord's prayer, a majority did not know what it was or where it came from, a majority did not own a Testament, and only two or three were the proud possessors of a Bible. Such ignorance is pitiable, but pitiable chiefly because it means lack of opportunity. Many of such teachers are half-grown boys and girls, who are in this way trying to earn the money, always so scarce in the mountains, "to go down to the settlements" and get an education. When their desire for knowledge is once aroused, they are strong, persistent, and ready to face any obstacle to get an education. Their vigorous minds, unjaded nerves, and hardened bodies combine to make them victors in the struggle. One boy of fourteen started out from his hillside home

with his little bundle of clothes slung over his shoulder and 75 cents. in his pocket, and tramped 25 miles over rough mountain trails to Berea, where the nearest school and college were. While taking the course there, he supported himself by regular jobs of various kinds, and maintained an excellent standing in his classes. When a mountain lad comes down to the State University at Lexington, it is a foregone conclusion that he is going to carry off the honours. We find at work in him the same forces that give success to the youth from the Swiss Alps and the glens of the Scotch Highlands, when these too come down into the plains to enter the fierce struggle for existence there. For the Kentucky lad, the change has meant a stride over an intervening hundred and fifty years.

The life of the Kentucky mountaineer bears the stamp of the eighteenth century. His cabin home is rich in the local colour of an age long past. The spinning-wheels for flax and wool, the bulky loom in the shed-room outside, the quaint coverlet on the beds within, the noon-mark on the door, and, more than all, the speech of the people, show how the current of time has swept by and left them in an eddy. The English they speak is that of the Elizabethan age. They say "buss" for kiss, "gorm" for muss, "pack" for carry, and "poke" for a small bag. Strong past tenses and perfect participles, like "holp" and "holpen," and the syllabic plural of words ending in *st*, like "beasties," are constantly heard. The Saxon pronoun "hit" survives not only in the upland regions of Kentucky, but also of the Virginias, Carolinas, and Tennessee. With the conserving power of the mountains has come into operation also their differentiating influence within their boundaries. Every valley has some peculiarity of vocabulary or speech which distinguishes it from the community across the adjoining range. The mountaineers have, therefore, criticized the dialect in John Fox's stories of this region, because they are not judges of the dialect of any locality but their own.

Survivals of speech are accompanied also by survivals of customs. In the mountains, the "rule of the road" when two horsemen or waggons meet is to turn to the left, as in England. Another relic of old Scotch or English custom we find in the "infare" or "infair," after a mountain wedding. This is the dinner given at the home of the groom's parents the day after the ceremony. It was observed in the rural districts of all Kentucky and Indiana up till fifty years ago, but now is adhered to only in the mountains. A more remarkable case of survival was discovered in 1878 by Prof. Nathaniel S. Shaler, of Harvard, on the borders of Virginia and Kentucky. There in a secluded valley he found men hunting squirrels and rabbits with old English short-bows. "These were not the contrivance of boys or of to-day, but were made and strung, and the arrows hefted in the ancient manner. The men, some of them old, were admirably skilled in their use; they assured

me that, like their fathers before them, they had ever used the bow and arrow for small game, reserving the costly ammunition of the rifle for deer and bear."

Though these people came into the mountains with eighteenth-century civilization, their isolation and poverty not only prevented them from progressing, but also forced them to revert to earlier usages which at the time of their coming were obsolescent. This is the explanation of the feud, as has been shown above, of the use of the hand-mill and short-bow, and especially of the old English ballad poetry which constitutes the literature of these mountain folk to-day. This has survived, or, more properly, flourished in its mediæval vigour because it has not felt the competition of books. The scant baggage of the pioneer immigrants from colonial Virginia and Carolina could not allow much space for books, and the few that did make the trip across the Appalachian mountains were used up, from much reading and handling, by one generation. Poverty and inaccessibility prevented an invasion of new books from without, and from within there was no competition from newspapers. There are to-day twenty contiguous mountain counties, covering altogether an area of 6000 square miles, not one of which can boast a printing-press. Under these circumstances, the Kentucky mountaineer reverted to his ancestral type of literature and revived ballad poetry. This has now been handed down from lip to lip through generations, the slightly variant form and phrase only testifying to its genuineness. The ballad of "Barbara Allen," popular in Great Britain three hundred years ago, and known now in America only to the musical antiquarian, is a stand-by in several of the mountain counties. The tragic ballad of "Little Sir Hugh," or "The Jewish Lady," as it is variously called, traces back to the Prior's Tale of Chaucer. The lengthy ballad of "Lord Bateman," or "The Turkish Lady," shows unmistakable identity with the poem of the same name in Kurlock's 'Ancient Scottish Ballads,' though the Scotch version is longer.

Animated by the spirit of minstrelsy, the mountaineers have composed ballads on the analogy of the ancient. These are romantic or heroic and of narrative length. We heard a woman sing a native ballad of fifty-two stanzas, entitled "Beauregard and Zollicoffer," which recounted the deeds of these two generals of the Civil War. The music for all these ballads is in a weird minor key, and is sung in a nasal tone. As far as we were able to judge, the women are the chief exponents of mountain minstrelsy, and the accuracy of their memories for these long poems is suggestive of Homeric days. Spain and Sicily are perhaps the only other parts of the civilized world, at least in Europe and America, where modern folk-songs are still composed in the form of ballad poetry.

The whole civilization of the Kentucky mountains is eloquent to

the anthropogeographer of the influence of physical environment, for nowhere else in modern times has that progressive Anglo-Saxon race been so long and so completely subjected to retarding conditions; and at no other time could the ensuing result present so startling a contrast to the achievement of the same race elsewhere as in this progressive twentieth century.

JORIS CAROLUS, DISCOVERER OF EDGE ISLAND.

A FORGOTTEN ARCTIC EXPLORER.

By Sir MARTIN CONWAY.

IN the year 1614 one Joris Carolus claimed to have reached lat. 83° N. I propose here to make a brief examination of his claim. He was by no means an unimportant person. Apparently a native of Enkhuizen, he took part in the wars of his time, and lost a leg at the siege of Ostend, whereupon he gave himself up to the art of navigation, and became a pilot. He describes himself always as Joris Carolus, Stierman. The stierman was responsible for the navigation of the ship and kept the log. In theory he was the next officer after the captain, but practically Barents and Carolus seem to have been the leaders of their expeditions. Carolus spent many years in the Indies in the service of the Oost-Indische Compagnie. He was a man of scientific mind, who collected all the information he could about matters concerning his art. When at length his years and growing feebleness prevented him from voyaging, he settled down at Amsterdam as teacher of navigation, and published a book of charts and sailing directions, now very rare, entitled *Het nieuw vermeerde Licht, ghenaemt de Sleutel van't Tresoor, Spiegel, Gesicht, ende vierighe Colom des Grooten Zeevaerts. Dat is claer ende seeckere beschrijvinghe van de Oost, West, Suydt ende Noordsche Navigatie, verciert met alle noodige perfecte ende duijdelycke Pas-kaarten, Opdoeninghen der Landen, Haven, Kapen ende Rivieren, aenwysinghe der Drooghten, Landen, Clippen ende Ondiepten; verscheijdentheijt der plaetsen, 800 deselve in mijlen, graden ende Compas-streecken van den omderen syn ghelegen. Alles van nieuws oversien, verbeetert ende vermeerdert, door Mr. Joris Carolus. Sierman. Leermeeester ende Caert-schryver van de groote en cleyne Zeevaert binnen de vermaerde Coopstadt Amsteldam. Ghedruckt tot Amsteldam. By Jan Janssen Boeckvercooper op't Water in de Paskaert. Anno 1634.* Of this work I can find no copy in England, but there is one in the Hague Archives, and I dare say there may be more copies in other Dutch libraries. The book contains one or two autobiographical passages.* Carolus states (p. 2)

* Quoted, in connection with the above information, by S. Müller, 'Geschiedenis der Noordsche Compagnie.' Utrecht, 1874, p. 168, *vide* also p. 195.

that all the soundings, measurements, and drawings of the European coasts comprised in this extensive book of maps were not derived from the account of others, but from his own observations. When writing about Greenland (p. 147), he states that he does not believe it to be connected with Spitsbergen, because a constant current flows along the coast of Spitsbergen, coming from the north. "This I observed in the year 1614, in which year I was as far north as 83° ," whereby he concluded that a route might be found that way if it were sought for.

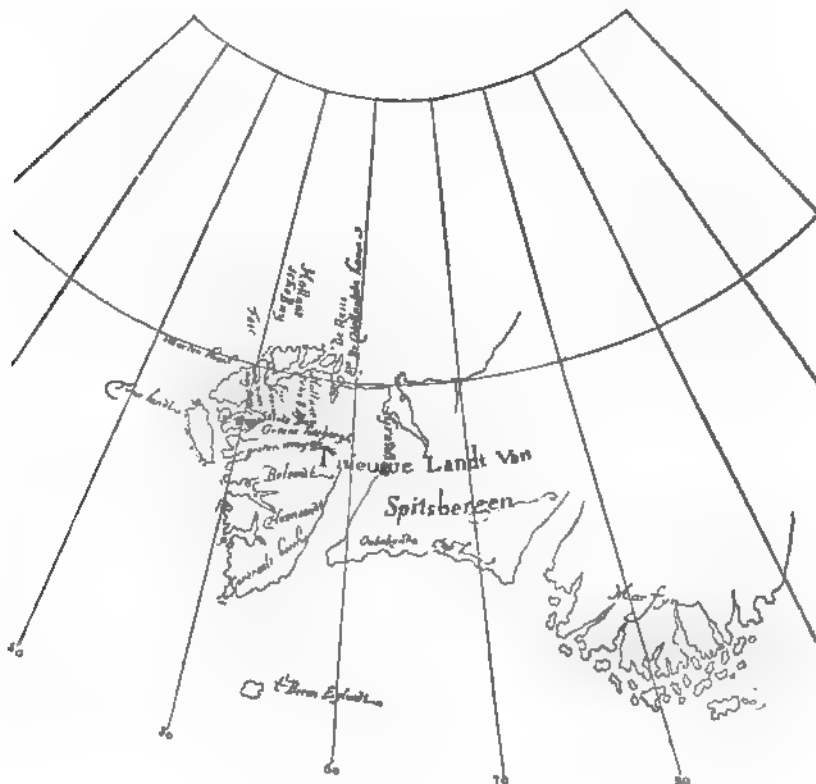
In the year 1614 the great Dutch whaling company, the Noordsche Company, was founded, and the fleet sent by it to Spitsbergen, under the command of Antonie Monier, was the first Dutch fleet strong enough to break down the English attempt to establish a monopoly there. Amongst the Dutch ships were two sent for discovery—*De goude Cath* of Amsterdam, Captain Jan Jacobsz. May, and *Den Orangienboom* of Enkhuizen, Captain Jacob de Gouwenaer. Joris Carolus was doubtless pilot on the Enkhuizen ship. Fotherby, who was up in Spitsbergen with Baffin that summer, hastened to Fairhaven early in June, "and so much the rather wee hasted," he writes,* "because we understood that the Hollanders also set forth a ship on discoverie." On July 6 the Hollanders were riding "in the north harbour of Fairehaven, and were ready for the first opportunity to discover." Later (p. 95) he writes, "the ninth of August two ships of the Hollanders, that were appointed for northern discovery, were seene thwart of Faire Haven, sayling to the southwards." Thus the time during which the Dutch ships were absent from Fairhaven and when they professed to have reached lat. 83° N. was between July 6 and August 9.

It happens that we possess in Fotherby's journal an exact account of the state of the ice-pack off the north coast of Spitsbergen during the month in question. So far from its having been an open season, it was one in which the ice was so tightly packed down upon the coast that even a whale-boat could not be taken beyond Wijde bay (Sir Thos. Smyth's inlet). On July 6 Fotherby climbed a hill near Red-cliff sound (Monier bay), and "saw the ice lye upon the sea so farre as we could discerne, so that the sea seemed to be wholly toured with ice; save onely to the eastwards, we thought that we saw the water beyond the ice." On July 14 the edge of the ice was only 2 miles from Red beach. On landing "we beheld great abundance of ice that lay close to the shore and also off at sea so farre as we could discerne." On August 1 they were just able to row to the shore near Grey hook, but found the ice, off the mouth of Wijde bay, "so close packt together that wee could not proceede any further with our shallops." Finally, on August 11 to 14 they found the conditions unchanged. It is obvious, therefore, that during this period no ship can possibly have sailed from Fairhaven,

* Hakluyt Society's 'Baffin,' p. 84.

reached lat. 83° N., and returned, as (apparently) Joris Carolus claimed to have done.

Whether the figure 83° was an after-thought may be questioned. It is not incorporated in the following important resolution of the States-General of January 16, 1615.* "The request having been read of Mr. Jooris Carolus, Stierman, recently sailed to Spitsbergen with Commissary Monier, to the whale-fishery, and having advanced his voyage towards the north pole to seek whether a passage could be



MS. MAP OF SPITSBERGEN MADE IN 1614, AND SIGNED "JORIS CAROLUS STIERMAN
CARTEGHEFFTER TOT ENKELHUSEN."

found by the sea of Tartary to China and Japan, according to the map made by him, which he has presented to their mightynesses, beseeching them to take his work into consideration, and offering them his services zealously at all times at their bidding to make further explorations; after deliberation it is resolved that, having regard to the supplicant's good will and zeal in the service of the land and the foregoing services which he has rendered, he be granted the sum of 72 guldens," etc.

* Printed by S. Muller, 'Noordsche Compagnie,' Appendix, p. 380.

The map in question does not appear to remain in the Dutch archives, but the same, or a manuscript copy of it, is in the "Département des cartes et plans de la marine" at Paris.* It is signed "Joris Carolus Stierman Caertschryver tot Enchn" (Enkhuizen), and dated 1614.

It may be objected that, though Carolus cannot have reached a high latitude between July 6 and August 9, he may have returned to the attack later in the season. But on August 9, the two Dutch ships in question were seen by the English passing the mouth of the South gat (where the English were anchored), and "sailing to the southwards." The map shows whither they went, and reveals a discovery which historians of arctic exploration have quite overlooked. East of, and in close proximity to Spitsbergen, it depicts two land-masses, divided by sounds from Spitsbergen and from one another. The western land-mass is named Onbekende Cust, the eastern Morfyn. Morfyn is a miswriting for Morsyn, by which the "Matsyn id est Plurimæ Insillæ" of Hondius' chart of 1611 is meant.† Matsyn we know to have been a part of Novaja Zemlja (Matoschin) shifted in longitude. Carolus did not know this. He merely had Hondius' chart before him, with a piece of land flanked by islands vaguely marked. Sailing round the South cape of Spitsbergen, which he named Generaels hoeck, and standing to the eastward he sighted land to the north (Whales point of Edge island). He erroneously made this land stretch almost across Wijbe Jans Water towards Spitsbergen. Continuing eastward, he passed Deicrows sound, and then sighted Negro point and the islands off it, especially noticing Halfmoon island, which he clearly marked on his chart. He erroneously exaggerated the width of the land he discovered, partly no doubt with the desire of bringing his Morfyn as nearly into the longitude of Hondius' Matsyn as he could. Thus it is certain that Edge island was discovered, not by Edge in 1616, but by Joris Carolus in 1614.

Matsyn was not invented by Hondius. It is marked on Gerardus Mercator's map of the polar regions, which includes Barents' discoveries, and therefore cannot be of 1569, as stated by Nordenskiöld in his atlas. It is also marked on the Molyneux globe in the Middle Temple Library, which marks Barents' wintering place of 1596-97, and cannot therefore be of 1592 as stated. Matsyn is likewise marked on other maps of about 1600, and on Gerrits' map in 'Detectio Freti' of 1612. In almost every case the coloration or shading indicates that Matsyn was regarded as belonging to Spitsbergen, whilst Willoughby Land is similarly connected with Novaja Zemlja. For this reason I am inclined to think that, though originally Matsyn was created out of Matoschin, it may

* Part of it is reproduced in E. T. Hamy, "Les Français au Spitzberg." Bull. de géog. hist. et descript. 1895 (Fig. 2). By his kindness in lending the cliché, we are enabled to republish the map herewith.

† In some maps Matsyn is written Marsyn, whence the transition to Morfyn is easy.

have been identified with Edge island and the Thousand islands even before Carolus' voyage of 1614.

From Edge island, where doubtless the ice-pack was encountered, the two Dutch ships sailed westward again toward Greenland. Running down the edge of the ice, they came in sight of Jan Mayen island, which they believed themselves to have discovered. It appears on Carolus' chart with the name Mr. Joris eylandt. There is likewise a cape called Jan Meys hoeck, and a bay called Gowenaers bay, after the captains of the two ships. Jan Mayen island was always getting discovered and named. Hudson first saw it in 1607, and named it Hudson's Touches. According to Scoresby, the whalers of Hull discovered it about 1611 or 1612, and named it Trinity island. The Dutch tradition, recorded by Zorgdrager, was that Jan Cornelisz. May discovered it in 1611; but this is a mistake, J. Cz. May of 1611 having been confused with J. Jz. May of 1614, and the name Jan Meys hoeck given by Joris having been transferred to the island in the form Jan Mayen. Jean Vrolicq, the Biscay whaler, claimed to have discovered it in 1612; he named it Isle de Richelieu. Finally, in 1615 Fotherby discovered it again, named it Sir Thomas Smith's island, and wrote the first detailed account of it.* The Dutch in the great days of the fishery always called it Mauritius island.

We thus find that the claims of Joris Carolus to have sailed to lat. 83° N. and to have discovered Jan Mayen island cannot be maintained; but in compensation he deserves to be credited with the discovery of Edge island, which he did not claim. It might be known by the name Morfyn, which he gave to it.

Muller (p. 171) has shown that, in the following year (1615), Joris Carolus made an important voyage to the north-west, which likewise has been forgotten. As in 1614 he anticipated Edge, so in 1615 Muller claims (p. 171) that he anticipated Baffin. In the service of the Noordsche Company, it appears he sailed through Davis strait, and reached lat. 80° N. The results of the voyage were depicted on a chart presented to the States-General, and referred to in a resolution of November 26, 1615.† This chart has not been found. In his 'Nieuw vermeerde Licht' (p. 148), Carolus describes Baffin's bay, and seems to imply in a rather vague fashion that he was there. He says it extends to 79°, and is then closed by land. That a Dutch expedition did penetrate north through Davis strait in 1615 is certain, but I think Carolus' presence on board is doubtful, whilst after the disproved claim of having reached 83° north of Spitsbergen, all other claims to exceptionally high latitudes must be discounted. We have to bear in mind that the object of voyages of discovery at this time was to find new trades, and

* Fotherby in Purchas, vol. iii. p. 729.

† Printed in Muller's Appendix, p. 381.

appropriate the monopoly of them to the country, or even the company of the discoverer. Hence the exaggerated latitudes claimed. Not the cold veracity of science, but the lax morality of competitive commerce, inspired the records of these expeditions. The reports of pilots exploring for trading companies are not scientific documents. Geographers must distrust them, much as geologists distrust the reports of mining prospectors.

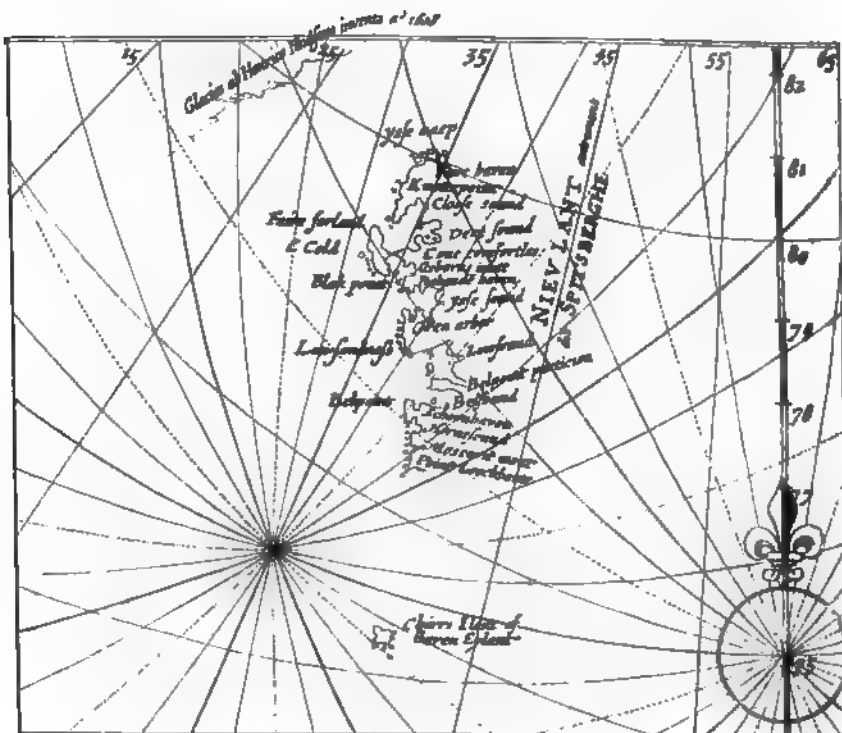
In 1617, Muller shows that Joris Carolus was again sent on discovery by the Delft, Hoorn, and Enkhuizen chambers of the Noordsche Company. This time he claimed to have found two islands. The first, named New Holland, was between lat. 60° and 63° N. Unless this was a pure invention, it must have been a known part of the east coast of Greenland. The other, named Opdams island, was in lat. 66° N., and 20 Dutch miles east of Iceland. The Noordsche Company applied to the States-General for the monopoly of fishing off these islands, which were depicted on a map supplied by Carolus. The monopoly was granted by a resolution of October 28, 1617.* We are thus driven to doubt Carolus' veracity. The single important discovery with which he ought to be credited was one which he appears never to have taken the trouble to claim.

As an author Carolus was really more important than as an explorer, but in this matter also fame has been unkind to him, and others have reaped his proper renown. His book, 'Het nieuw Vermeerde Licht ende vierighe Colom des Grooten Zeevaerts,' has been practically forgotten, or rather the fact that the book was his has been forgotten. The book itself was issued again and again in different editions and translations, each of which was boldly appropriated by its editor as his own work. The original edition was published in 1634. Anthony Jacobsz, of Amsterdam, issued a new and revised edition of it in 1645, under the title 'De lichtende Colomne ofte Zee Spiegel.' In 1548, Jacob Aertsz. Colom published it likewise at Amsterdam, and claimed to be its author. He entitled it 'De Vyerighe Colom, etc. . . . samengebracht en beschreven door J.A.C.' In the following year he published an English edition: 'The New Fierie Sea-Colomne Wherein the faults, and mistakings of the former contrefaited Lichtning Colomne, are plainely discovered, and corrected.' J. A. Colom's second Dutch edition was issued in 1654. In 1655, Hendrick Donckers, of Amsterdam, stole, revised, and issued it. Finally, in 1671, John Seller, of London, published a slightly revised translation of Donckers' edition, under the new name, 'The English Pilot.' Of all these editions the first is the only one that contains the original author's name.

The first edition is most interesting, not alone for the text with its personal touches, but for the maps. The map of Spitsbergen, here

* Printed in Müller's Appendix, p. 382.

reproduced, is the original. It was copied again and again, often very faultily, by all manner of map-makers for a long series of years. It appears between pp. 146 and 147 of 'Het nieuw Vermeerde Licht.' This map, however, is not really by Carolus, but is a copy with some additions of the lost chart by the Englishman John Daniel. We have no information at all as to who John Daniel was, except that he was an Englishman, and that he drew his chart in London in 1612. These facts are stated in Hessel Gerrits' 'Histoire du pays nommé Spitzberg' (Amsterdam, 1613) and in I. Commelijn's 'Begin ende Voortgaangh



JOHN DANIEL'S CHART OF SPITSBERGEN.

Published in Hessel Gerritsz' *Histoire du pays nommé Soltsberg* (Amsterdam, 1619).

vande Nederlandtsche Oostindische Compagnie' (Amsterdam, 1644). In the former the chart is published, as originally drawn, by Daniel (here reproduced); but Commelijn's issue of Daniel's chart is a copy of Carolus' chart of 1634 (likewise here reproduced). Thus Carolus' chart of 1634 is merely Daniel's with some additions to the north and east.

We know that in the year 1612 the first Dutch whaling ship went to Spitsbergen under the command of William Cornelisz. van Muyden and piloted by an English deserter named Allen Sallowes, "a man imployed by the Muscovia Companie in the Northerne Seas for the space

of twentie yeeres before; who leaving his country for debt, was enter-tayned by the Hollanders, and imployed by them to bring them to Greenland [Spitsbergen] for their Pylot." Doubtless Daniel's chart went over to Holland in Sallowes' pocket. As that chart includes the English discoveries of the year 1611, Daniel (if he was not a mere draughtsman who had access to some of the materials afterwards worked up by Edge) must have taken part in the expedition of that year.

Daniel's original chart only depicts the west coast from South cape or Point Look-out to Fairhaven in the extreme north-west. It is thus the final authority for the original nomenclature of the west coast.

The second edition of Daniel's chart, which I have yet found, is included in a map of Europe, engraved by Abraham Goos of Amsterdam in 1620, and published in 1621 under the following title : *Nieuwe Pascaerte van alle de Zeecusten van geheel Europa . . . perfectelijck afgeteikent door Harmen en Marten Iansz. vermaert Caartschrijvers tot Edam ende gedrukt t'Amsterdam bij Ian Eversz. Cloppenbg. op't water in den vergulden Bijbel bij de Corenmarkt. Anno 1621.* The only copy of this chart that I have seen is one in the possession of Baron A. E. Nordenskiöld, who permitted me to take a tracing of it. Here the west coast is copied with little change from Hessel Gerrits' Daniel, but the nomenclature is Dutch. Two bays are added along the north coast, and the mouth of Wybe Jansz. Water is indicated, whilst away to the east is Swarthoeck, as though it had no connection with the east coast of Wybe Jansz. Water. Hoop eylant is marked near it.

This was the form of Daniel's chart copied by Jean Guérard of Dieppe in 1628, and by Joris Carolus in his 'Nieuw vermeerde Licht' of 1634. There would be nothing remarkable in this fact were it not for the existence of Carolus' own original chart of 1614 (above reproduced). I can suggest no explanation for the total omission by Carolus in 1634 of the south coast of Edge island and of the islands off it which are so elaborately indicated from his own survey in his map of 1614. It was only on maps copied from Edge's that Edge's land and the coasts of Wybe Jansz. Water were duly indicated till about the year 1660, or even later.

Carolus' version of Daniel's chart became one of the two typical Dutch representations of Spitsbergen for about thirty years. It was copied, as I have stated, in Commelijn's book in 1644. It was copied again in 1648 in Jacob Aertsz. Colom's edition of Carolus' Atlas, and in at least one manuscript chart (Brit. Mus., S.T.A. (2) f.). It was copied by Pieter Goes and Cornelis de Leeuw in 1650 (Brit. Mus., 982 (13)), and by Janssen of Amsterdam about the same date (Brit. Mus., 982 (11)). It is found in W. Jsz. Blaeu's 'Zeespiegel' (Amsterdam, 1652), and, as an inset, in a 'Pascaarte' drawn by Cornelis Doedsz. of Edam, and published by Willem Jansz. (of Amsterdam) perhaps about the same time. Its last appearance, as far as I know, is in Constantin de

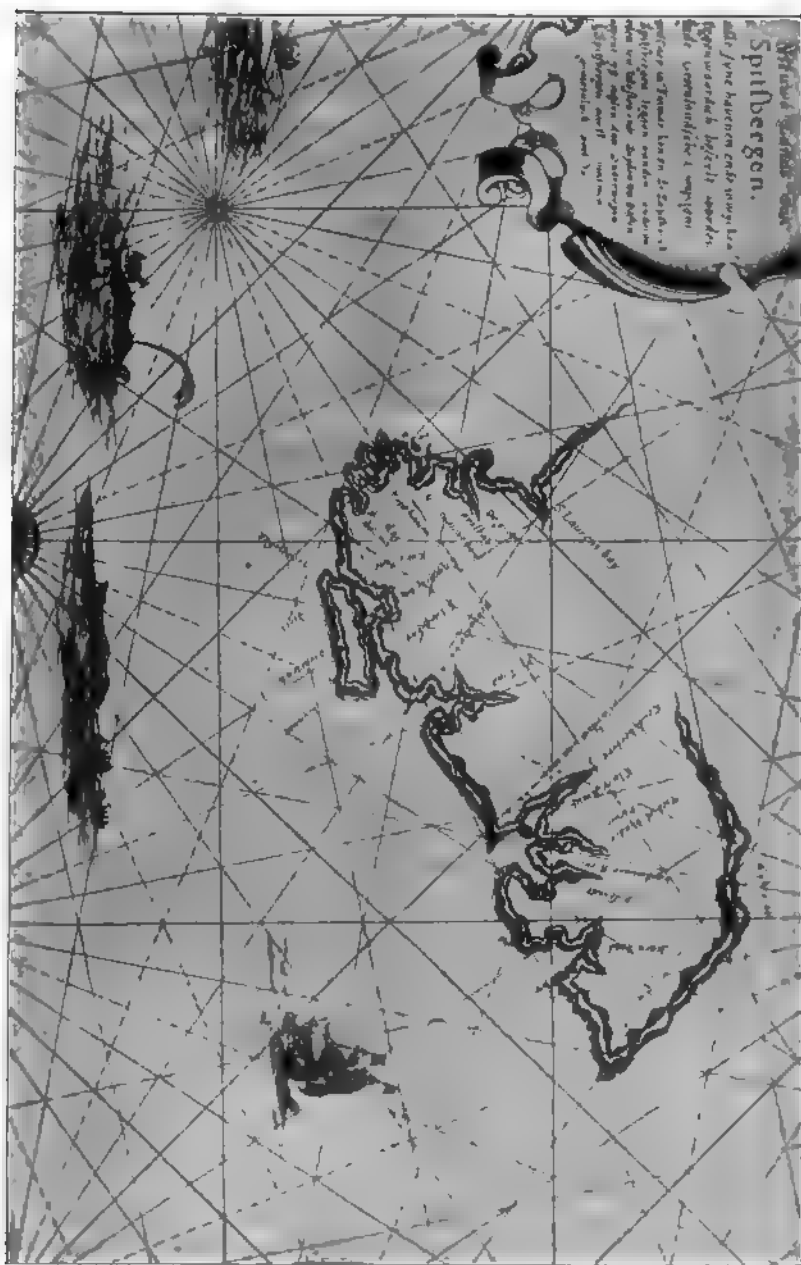


CHART OF SPITSBERGEN, FROM JORIS CAROLUS' 'NIEUW VERMEERDE LICHT' OF 1634.
(John Daniel's type.)

Reneville's 'Voyages' (vol. i. p. 94) and in the English translation of some of them (London, 1703).

The vitality of Daniel's chart is extraordinary, in view of the fact that it was utterly surpassed in accuracy and completeness by Edge's map, which was published by Purchas in 1625, and in Pelham's 'God's Power and Providence' in 1631, both works that obtained a wide circulation. Moreover, Edge's map was not forgotten. It was reproduced in numerous editions, and with various degrees of inaccuracy.* It was the one that gradually grew to better accuracy under the hands of Pieter Goos (c. 1666) and the Van Keulens, and was finally revised by the Captains Giles and Rep after 1707. But while that process of development was going on, Daniel's chart kept being reissued with little or no modification and by some of the publishers who were simultaneously issuing revised versions of Edge's!

SIR T. HOLDICH'S 'THE INDIAN BORDERLAND.'—REVIEW.†

By Sir GEORGE S. ROBERTSON, K.C.S.I.

THIS is a good book. It is well written, well arranged, well balanced. It abounds in graphic narration, in picturesque details, and is so full of information of every conceivable kind about the north-west frontier country of India, that a careful student of its chapters, even if he were never to stir out of London, might set up as an average expert, only with more than an average expert's knowledge, of the borderland so vividly painted. If, in addition, this careful student were to follow out the broad paths and the by-roads, which Sir Thomas Holdich has only the space to indicate by finger-posts, he might soon qualify as one who really knew his subject. After long days spent in actual survey work and in local study of this Indian frontier—from 1878 to his retirement a year or two ago—the author, in his statements of opinion concerning the great questions of the time, maintains always a high standpoint and a comprehensive outlook. Therefore his judgments, clear and simple, are invariably thoughtful and suggestive, however unable one may be to see eye to eye with him in all things. And what a romantic life that of this Indian survey officer has been! His pages are as full of adventure as a book for boys. Perils of all kinds are set down with the true natural touch—perils by flood, perils by cold, perils by sun flare and drought, most of all perils from

* In the following: Sir Robert Dudley's 'Dell' Arcano del Mare' (Florence, 1630); W. Blaeu's Atlas, c. 1660, and other editions; H. Hexham's Atlas, 1636; 'Pascaert,' by Johannes van Loon, c. 1660; 'Spitzberga,' by G. Valk et P. Schenk, no date; 'Pascaarte . . . van Europa,' W., P., and J. Blaeu (Amsterdam, 1677).

† 'The Indian Borderland: being a Personal Narrative of Twenty Years.' By Sir T. H. Holdich, K.C.I.E. Methuen & Co. 1901.

the fierce instincts of wild tribesmen. For instance, there is a particularly vivid account of the ascent of the Shuidar peak and the march down again. The climb was not without incident, but the return journey, with the rattle of ambushed musketry and a thunderstorm bursting out together, the battle-cry of the Sikhs surprising the surprisers, and the general picture of havoc and anger, is not readily to be forgotten. Again, the blizzard, accompanied with a mud cataclysm on the Chashma Sabz, is told in a way to make one shiver. At the same time there are everywhere beautiful descriptions of changing lights and atmospheric effects, a keen eye for colour, a love of flowers, a delight in beauty for its own sake. The poetry of those vast, silent, melancholy districts has sunk very deeply into the heart of the soldier-author. One's imagination is excited and gratified by the brilliant translation into words of the glories of a wonderful salt-mine on the island of Kishm; while the lovely night picture of a throbbing steamer, spars and masts illumined, disclosing the hidden radiance of a glowing silver sea which dims even the bright stars to ineffectual fires, rises in the mind again and again.

The great permanent value of Sir Thomas Holdich's book is in its geography, especially its political geography, and for the sane and lucid conclusions which he builds upon unchangeable geographical facts. Its value in these directions can hardly be overestimated. The chapters on the Russo-Afghan Boundary Commission are remarkable, even when all are praiseworthy. Every one interested in that melancholy delimitation of the Afghan and Russian frontiers must read them. Never was a humiliating national episode so agreeably told. The charm of the descriptions, and the pleasant little digressions into humorous memories and picturesque incidents, turn a depressing, humbling story actually into something delightful to listen to. Greater praise it is impossible to give. Beluchistan and the Persian gulf are written of with full knowledge and excellent judiciousness. The "Durand Boundary" is very good indeed. Sir Thomas Holdich is also at his best in that portion of the book dealing with the Pamirs—lucid explanations, impressive presentments of facts, and a narrative style full of interest, strongly attractive. Concerning the Kunar valley and Kafiristan, the constricting surveillance of the Afghan escort hampered Sir Richard Udny's commission in every way, and its effects are reflected in Sir Thomas Holdich's pages. Here alone does he seem to be somewhat hasty and superficial at times. Of Makran and its important delimitation to the west, in conjunction with Persian officials, we are told very entertainingly. Even that uncomfortable country and its terrible wind suggest only pleasant and cheerful thoughts in the memory of the stout-hearted sapper. The chapters dealing with the great frontier uprising in 1887 will not permit themselves to be merely glanced over; they compel attention. In a very fitting manner they wind up these

valuable experiences; the record ends, as it began, in war and adventure. We learn that the fault of native Indian plane-tablers is, they will not retreat fast enough when danger hovers near and the bullets begin to drop around them; they grow too absorbed in their work, they stay too long. But we at least get in return a brave picture of professional enthusiasm and devotion to duty. These characteristics, it may be added, of the Indian Survey Department, in all its grades, shine between the lines of this delightful book from cover to cover.

There are a few blemishes of minor importance which might well be removed in the next edition. It seems, too, almost a pity to introduce a new spelling for the long-accepted word Kafiristan. A pedantic critic might object to the statement on page 378 that when Nadir Shah was assassinated, "one Ahmad Khan, of the Saddozai section of the Abdali clan, a *Durani*, was one of the first" to hear of it. At that time, of course, there were no Duranis. Later, at Kandahar, Ahmad Khan himself altered the name of his tribe from Abdali to Durani (Dur-i-Duran, "Pearl of Pearls"), the result, it is said, of a vision. On page 256, a Chitrali prince of renown, Ghulam Dast-i-Gir, so called in honour of the great Pir Dast-i-Gir (is not his shrine at Baghdad?), is twice called by the impossible single name of Dastagird. The statement is made in the chapter upon Kafiristan that "no European has ever had dealings with any but the Kafirs of Kamdesh and the Bashgal valley. By implication that seems to turn the writer of this review into an American, as he certainly passed troublous days in the Viron or Presun valley, and had personal dealings with Kti, Kulam, Wai, and Ramgul Kafirs besides. Finally, there is some want of correspondency in the spelling of words in the book and in the map, the spelling of Merv and Ormarah, for example, as well as a few other instances showing the necessity for revision.

In conclusion, it may be said that on his own ground, as an admirable survey officer, as a scientific soldier, as an accomplished observer possessed of insight, humour, and sympathy, and as a peculiarly lucid, graphic, and eloquent writer, Sir Thomas Holdich is unequalled by any other authority on questions relating to the north-west frontier of India. His careful conclusions on the various railway projects through Afghanistan and Persia are based on immutable physical conditions; they seem to me to be convincing. Every one inclined to talk vaguely about railways across the Pamirs to India, or along the eastern shores of the Persian gulf, will find room for pause and reflection after reading these interesting pages. This is not the place to discuss the author's views on political questions, where, naturally, there is room for wide divergence of opinion. Numerous illustrations add greatly to the value of a book which no one will put down without regret, or without turning back to re-read some of its striking passages.

THE GREAT JAPANESE EARTHQUAKE OF OCTOBER 28, 1891.

By CHARLES DAVISON, Sc.D., F.G.S.

ALTHOUGH nearly ten years have elapsed since the occurrence of the greatest of Japanese earthquakes, the final report that will embody the labours of all its investigators has not yet been published. We possess a series of partial reports by Japanese seismologists, and others have studied special features of the case. The following account, which is based on these memoirs, is therefore to a certain extent incomplete. There are several points on which we have little or no information; but, with regard to those of general importance, the main results are already known.

The complicated nature and effects of the earthquake naturally rendered some

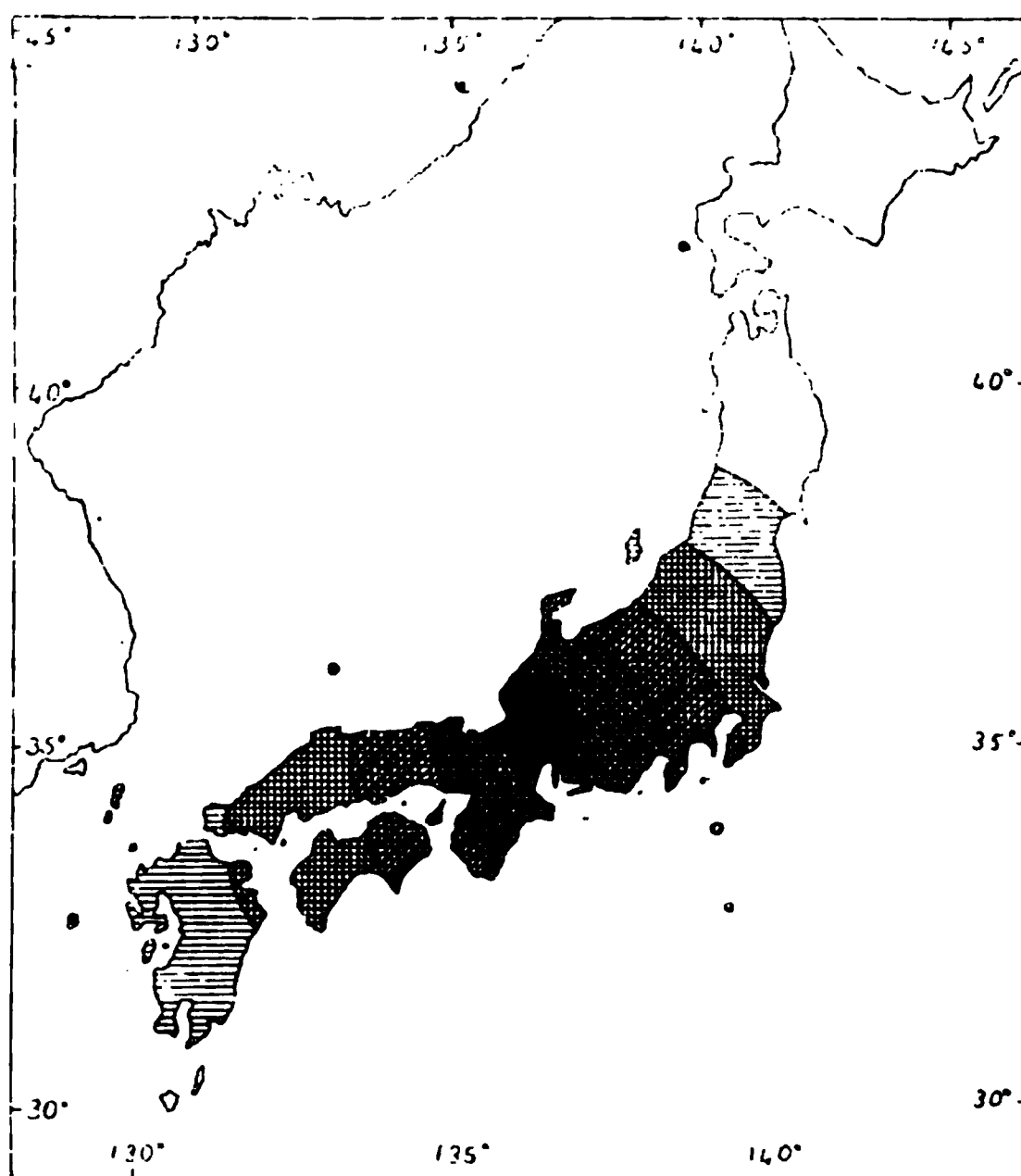


FIG. 1.—SKETCH-MAP OF DISTURBED AREA AND ISOSEISMAL LINES. MASATO (7).

division of labour necessary or advisable. Prof. Koto undertook the examination of the remarkable fault-scarp; the investigation of the numerous after-shocks was allotted to Prof. Omori, who also paid several visits to the epicentral area and made inquiries on various points; Mr. Conder studied the damaged buildings from an architect's point of view; while Prof. Tanakadate and Dr. Nagaoka devoted themselves to a re-determination of the magnetic elements of the central district. By the compilation of his great catalogue of Japanese earthquakes during the years 1885–1892, Prof. Milne has also provided the materials for a further analysis of the minor shocks which preceded and followed the principal earthquake.

The part of Japan over which the earthquake was sensibly felt is shown in Fig. 1. The small black area in the centre is that in which the shock was most

severe and the principal damage to life and property occurred. The other bands, more or less darkly shaded according to the greater or less intensity of the shock, will be referred to afterwards. Fig. 5 represents the meizoseismal area on a larger scale; and, as the greater part of it lies within the two provinces of Mino and Owari, the earthquake is generally known among the Japanese themselves as the Mino-Owari earthquake of 1891.

THE MEIZOSEISMAL AREA.

More than half of the meizoseismal area occupies a low flat plain of not less than 400 square miles in extent. On all sides but the south, the plain, which is a continuation of the depression forming the Sea of Isé, is surrounded by mountain

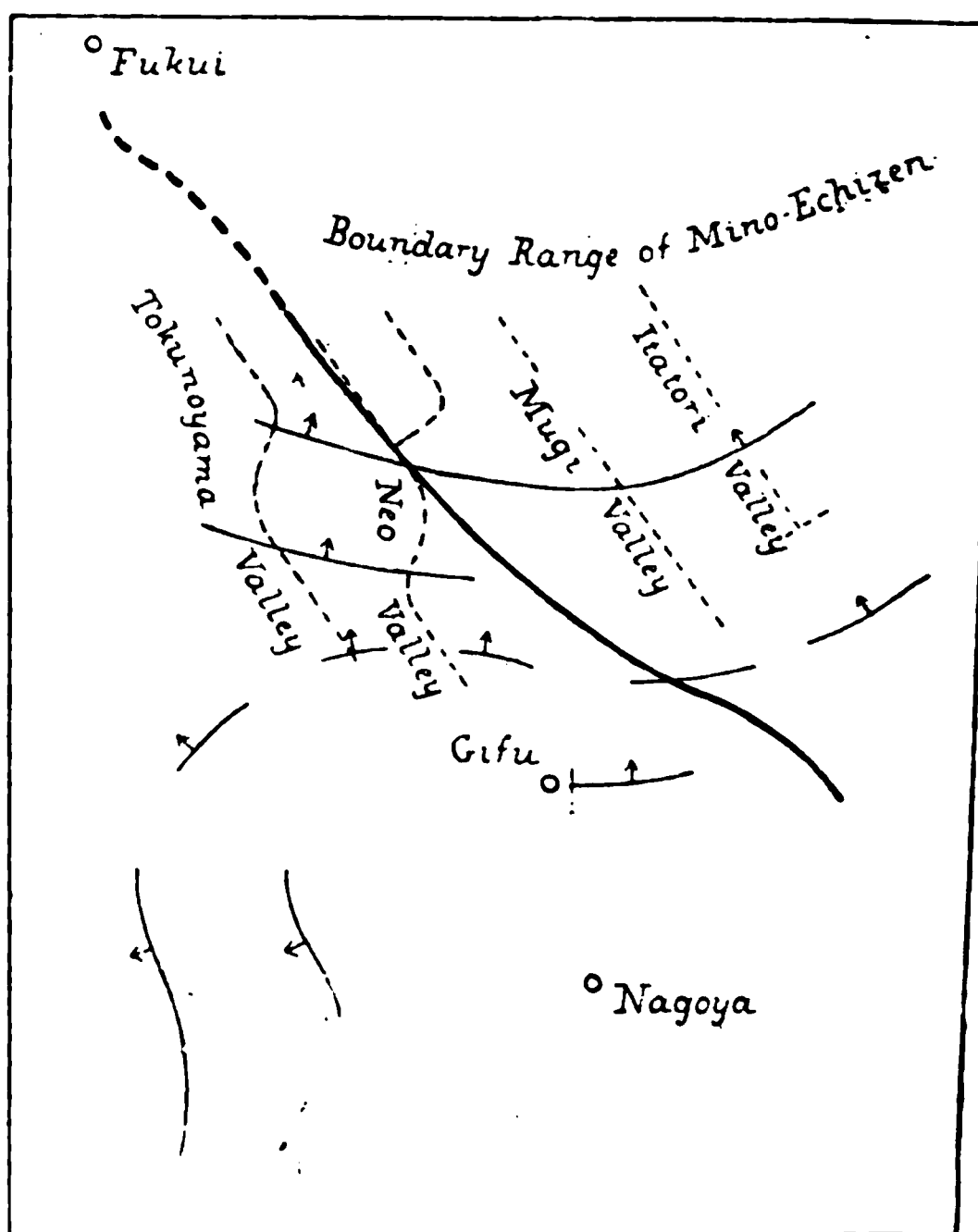


FIG. 2.—GENERAL PLAN OF GEOLOGICAL STRUCTURE OF MEIZOSEISMAL AREA. KOTO (6).

ranges, those to the west, north, and north-east being built up mainly of Palæozoic rocks, and those on the east side of granite. A network of rivers and canals converts what might otherwise have been unproductive ground into one of the most fertile districts in Japan. A great garden, as it has been aptly termed, the whole plain is covered with rice-fields, and supports a population of about 787 to the square mile—a density which is exceeded in only six counties of England. As a rule, the soil is a loose, incoherent, fine sand, with but little clayey matter; and it is, no doubt, to its sandy nature that the disastrous effects of the earthquake were largely due. In the northern half of the district, the meizoseismal area is much narrower, and here it crosses a great mountain range running from south-west to north-east and separating the river-systems of the Japan sea from those of the Pacific. To the north, the meizoseismal area terminates in another plain, in the

centre of which lies the city of Fukui, where the destructiveness of the earthquake was only inferior to that experienced in the provinces of Mino and Owari. There is also a detached portion of the area lying to the east of Lake Biwa, but it is uncertain whether the exceptional intensity there was due to the nature of the ground or to the occurrence of a secondary or sympathetic earthquake in its immediate neighbourhood.

The general plan of the geological structure of the central district is represented in Fig. 2. The thick line, partly continuous and partly broken, shows the course of the great fault, to the growth of which the earthquake chiefly owed its origin; while the thin continuous lines represent the changing direction of strike of the Palæozoic rocks which surround the Mino-Owari plain, and the arrowheads the direction of the dip. It will be seen that the direction of the strike forms an S-shaped curve, and it is clear that the present torsion-structure of the district could not have been produced without the formation of many fractures at right angles and parallel to the lines of strike. Prof. Koto points out that the regular and parallel valleys of the rivers Tokuno-yama, Neo, Mugi, and Itatori, indicated by broken lines in Fig. 2, have probably been excavated along a series of transverse fractures running from north-west to south-east; while fractures which are parallel to the line of strike may be responsible for the zigzag course of the valleys.

DAMAGE CAUSED BY THE EARTHQUAKE.

The great earthquake occurred at 6.37 a.m., practically without warning, and in a few seconds thousands of houses were levelled with the ground. Within the whole meizoseismal area there was hardly a building left undamaged. The road from Nagoya to Gifu, more than 20 miles in length, and formerly bordered by an almost continuous succession of villages, was converted into a narrow lane between two long drawn-out banks of *débris*. "In some streets," says Prof. Milne, "it appeared as if the houses had been pushed down from the end, and they had fallen like a row of cards." Or, again, a mass of heaped-up rubbish might be passed, "where sticks and earth and tiles were so thoroughly mixed that traces of streets or indications of building had been entirely lost." At Gifu, Ogaki, Kasamatsu, and other towns, fires broke out after the earthquake. In Kasamatsu the destruction was absolutely complete; nothing was left but a heap of plaster, mud, tiles, and charred timbers. At Ogaki, not more than thirty out of 8000 houses remained standing, and these were all much damaged. Within the whole district, according to the official returns, 197,530 buildings were entirely destroyed, 78,296 half destroyed, and 5934 shattered and burnt; while 7279 persons were killed, and 17,393 were wounded.

Next to buildings, the embankments which border the rivers and canals suffered the most serious damage, no less than 317 miles of such works having to be repaired. Railway-lines were twisted or bent in many places, the total length demolished being more than 10 miles. In cuttings, 20 feet or more in depth, both rails and sleepers were unmoved; it was on the plains that the effects of the earthquake were most marked. The ground appeared as if piled up into bolster-like ridges between the sleepers, and in many places the sleepers had moved endways. When the line crossed a small depression in the general level of the plain, the whole of the track was bowed, as if the ground were permanently compressed at such places. "Effects of compression," says Prof. Milne, "were most marked on some of the embankments, which gradually raise the line to the level of the bridges. On some of these, the track was bent in and out until it resembled a serpent wriggling up a slope. . . . Close to the bridges the embankments had

generally disappeared, and the rails and sleepers were hanging in the air in huge catenaries."

DISTURBED AREA AND ISOSEISMAL LINES.

The land area disturbed by the earthquake and the different isoseismal lines are shown in Fig. 1. The "most severely shaken" district, that in which the destruction of buildings and engineering works was nearly complete, contains an area of 4286 square miles, or about two-thirds that of Yorkshire. This is indicated on the map by the black portion. Outside this lies the "very severely shaken" district, 17,325 square miles in area, extending from Kōbe on the west to Shizuoka on the east, in which ordinary buildings were destroyed, walls fractured, embankments and roads damaged, and bridges broken down. The third or "severely shaken" district contains 20,183 square miles; and in this some walls were cracked, pendulum clocks stopped, and furniture, crockery, etc., overthrown. Tokio and Yokohama lie just within this area. In the fourth region the shock was "weak," the motion being distinctly felt, but not causing people to run out of doors; and in the fifth it was "slight," or just sufficient to be felt. These two regions together include an area of 51,976 square miles.

Thus, the land-area disturbed amounts altogether to 93,770 square miles, i.e. to a little more than the area of Great Britain. According to Prof. Omori, the mean radius of propagation was about 323 miles, and the total disturbed area must therefore have been about 330,000 square miles, or nearly four times the area of Great Britain. Considering the extraordinary intensity of the shock in the central district, this can hardly be regarded as an over-estimate.

The isoseismal lines shown in Fig. 1 are not to be regarded as drawn with great accuracy; for there is no marked separation between the tests corresponding to the different degrees of the scale of intensity. The seismographs at Gifu and Nagoya were thrown down within the first few seconds, and failed to record the principal motion. But a great number of well-formed stone lanterns and tombstones were overturned, and, from the dimensions of these, Prof. Omori calculated the maximum horizontal acceleration necessary for overturning them at fifty-nine places within the meizoseismal area.* At five of these it exceeded 4000 millimetres per second per second, an acceleration equal to about five-twelfths of that due to gravity. Making use of these observations, Prof. Omori has drawn two isoseismal lines within the central district, which are shown in Fig. 4. At every point of the curve marked 2, the maximum acceleration was 2000 millimetres per second per second, and of that marked 1, 800 millimetres per second per second. The dotted line within the curve marked 2 represents the boundary of the meizoseismal area, which, it will be observed, differs slightly from that given by Prof. Koto (see Fig. 5). The difference, however, is apparently due to the standard of intensity adopted, Prof. Koto's boundary agreeing rather closely with the curve marked 2 in Fig. 4.

NATURE OF THE SHOCK.

Little has yet been made known with regard to the nature of the shock, and the published records of the accompanying sound are so rare that it seems as a rule to have passed unheard. The seismographs at Gifu and Nagoya registered the first

* From the formula $\alpha = \frac{xg}{y}$, where α is the maximum horizontal acceleration, g the acceleration due to gravity, y the height of the centre of gravity, and x its horizontal distance from the edge about which the body was overturned.

half-dozen vibrations, and were then buried beneath the fallen buildings. In the following table, the data from these two stations are therefore incomplete :—

PRINCIPAL MEASUREMENTS OBTAINED FROM SEISMOGRAPHIC RECORDS.

	Gifu.	Nagoya.	Osaka.	Tokio (Imp. Univ.).
Maximum horizontal motion ...	> 18 mm.	> 26 mm.	30 mm.	> 35 mm.
Period of ditto	2.0 secs.	1.3 sec.	1.0 sec.	2.0 secs.
Maximum vertical motion ...	> 11.3 mm.	6.2 mm.	8 mm.	9.5 mm.
Period of ditto	0.9 sec.	1.5 sec.	1.0 sec.	2.4 secs.

If the period of the principal vibrations were known, the observations of Prof. Omori on the overturning of bodies would enable us to determine the range of motion at different places. For instance, the maximum acceleration at Nagoya was found by these observations to be 2600 millimetres per second per second, and if we take the period of the greatest horizontal motion to be the same as that of the initial vibrations, namely, 1.3 second, the total range (or double amplitude) would be 223 millimetres, or 8.8 inches. With the same period, and the maximum acceleration observed (at Iwakura and Konaki) of more than 4300 millimetres per second per second, the total range would be greater than 14.5 inches.*

In the meizoseismal area, many persons saw waves crossing the surface of the ground. At Akasaka, according to one witness, the waves came down the streets in lines, their height being perhaps 1 foot, and their length between 10 and 30 feet. To the north of the same area, we are told that "the shore-line rose and fell, and with this rising and falling the waters receded and advanced." Even at Tokio, which is about 175 miles from the epicentre, the tilting of the ground was very noticeable. After watching his seismographs for about two minutes, Prof. Milne next observed the water in an adjoining tank, 80 feet long and 28 feet wide, with nearly vertical sides. "At the time it was holding about 17 feet of water, which was running across its breadth, rising first on one side and then on the other to a height of about 2 feet." Still clearer is the evidence of the seismographs in the same city. Instead of a number of irregular waves, all the records show

a series of clean-cut curves. The heavy masses in the horizontal pendulums were tilted instead of remaining as steady points. They were not simply swinging, for the period of the undulations differed from that of the seismograph when set swinging, and also varied in successive undulations. It was ascertained afterwards,

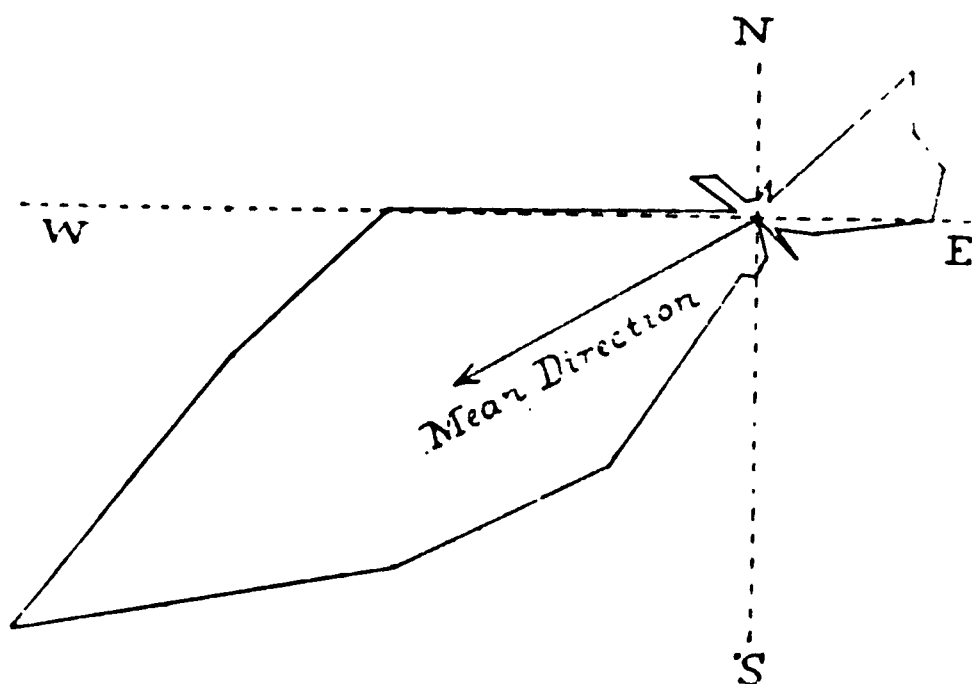


FIG. 3.—PLAN OF DIRECTIONS OF FALL OF OVERTURNED BODIES AT NAGOYA.

* These estimates are made, on the supposition of simple harmonic motion, from the formula $2a = \frac{at^2}{2\pi^2}$, where $2a$ is the total range or double amplitude, a the maximum acceleration, and t the period, of the vibration.

by measurement with a level, that to produce these deflections, the seismograph must have been tilted through an angle of about one-third of a degree.

Direction of the Shock.—Shortly after the earthquake, Prof. Omori travelled over the meizoseismal area and made a large number of observations on the directions in which bodies were overturned, taking care to include only those in which the direction of falling would not be influenced by the form of the base, such as the cylindrical stone lanterns so frequently found in Japanese gardens. At some places these bodies fell in various directions, at others with considerable uniformity in one direction. For instance, at Nagoya, out of 200 stone lanterns with cylindrical stems, 119 fell between west and south, and 36 between east and north; the

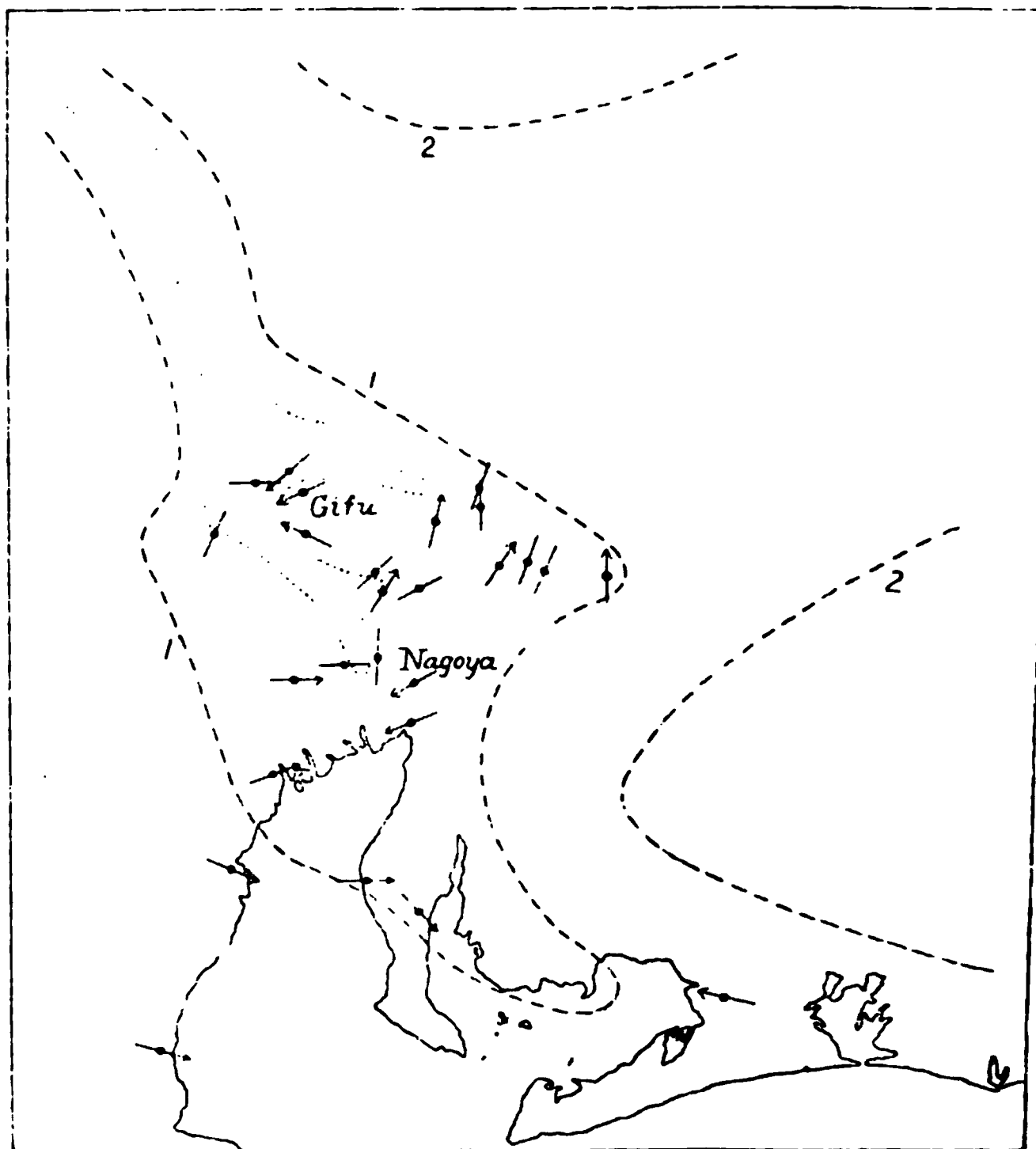


FIG. 4.—MAP OF MEAN DIRECTION OF SHOCK AND ISOSEISMAL LINES IN CENTRAL DISTRICT. OMORI (13).

numbers falling within successive angles of 15° being represented in Fig. 3. The mean direction of fall is $W. 30^\circ S.$, coinciding with that in which the majority of the lanterns were overturned. Similar observations were made at forty-two other places within and near the meizoseismal area, and the resulting mean direction for each such place in the Mino-Owari district is shown by short lines in Fig. 4, the arrow indicating the direction towards which the majority of bodies at a given place were overturned. It will be seen from this map that the direction of the earthquake motion was generally at right angles, or nearly so, to that of the neighbouring part of the meizoseismal zone, and that on both sides of it, the majority of overturned bodies at each place fell towards this zone.

VELOCITY OF THE EARTH-WAVES.

The times of the great earthquake and of sixteen minor shocks on October 28 and 29 and November 6 were determined at the Central Meteorological Observatory at Tokio, and at either two or three of the observatories of Gifu, Nagoya, and Osaka, each of which is provided with a seismograph and chronometer. The after-

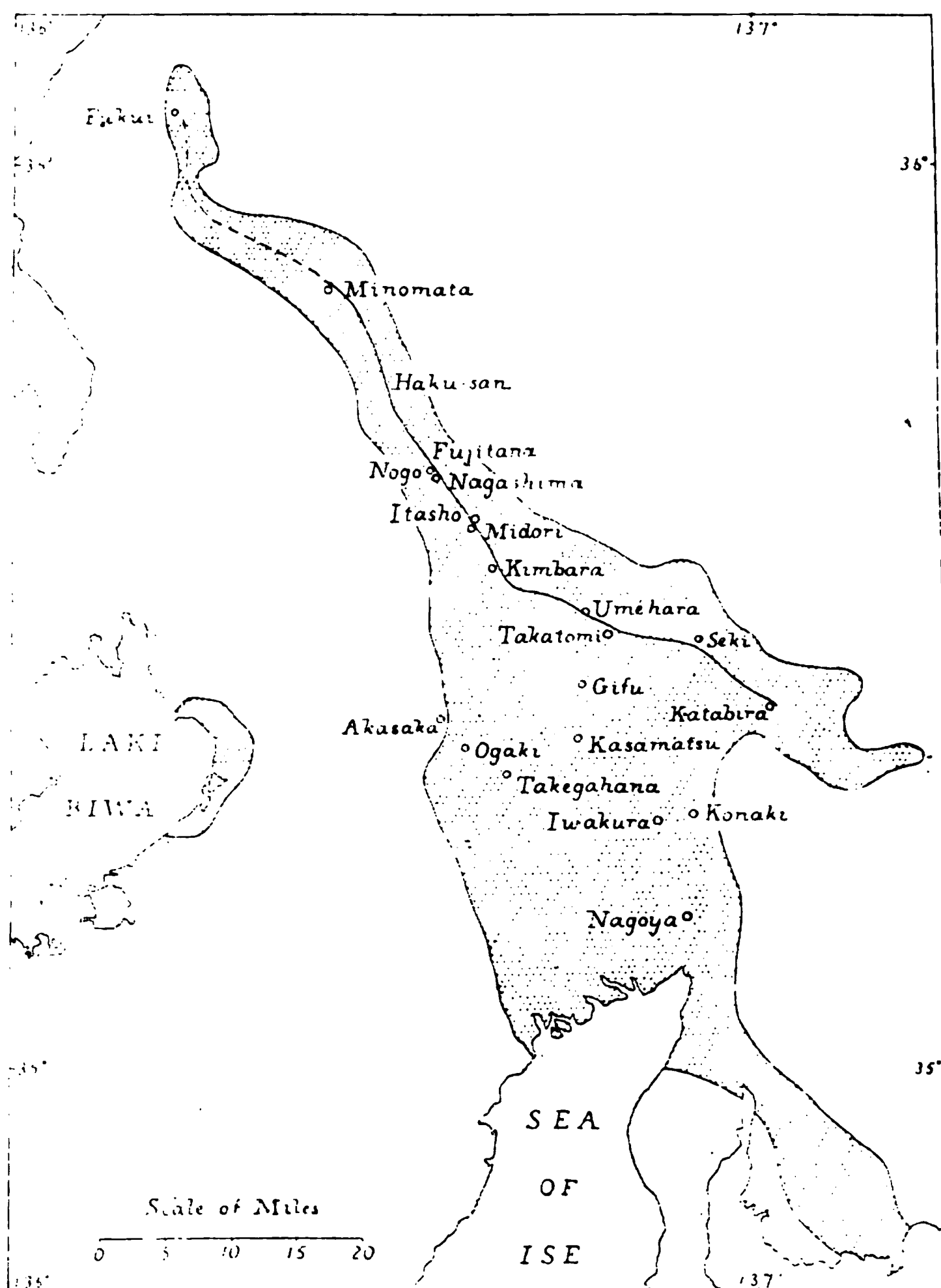


FIG. 5.—MAP OF MEIZOSEISMAL AREA. KOTO (6).

shocks referred to originated near a point about 6 miles west of Gifu, and the difference between the distances of Tokio and Osaka from this point is $89\frac{1}{2}$ miles, of Tokio and Nagoya 147 miles, and of Tokio and Gifu 165 miles. The mean time-intervals between these three pairs of places were 67, 111, and 128 seconds respectively, and these give for the mean velocity for each interval 2.1 kilometres (or 1.3

miles) per second. Thus there appears in these cases to be no sensible variation in the velocity with the distance from the origin.

As might be expected, an earthquake of such severity was recorded by magnetometers at several distant observatories. Disturbances on the registers of Zikawei (China), Mauritius, Utrecht, and Greenwich have been attributed to the Japanese earthquake, but the times at which they commenced are too indefinite to allow of any determination of the surface-velocity of the earth-waves to great distances from the origin.

THE GREAT FAULT-SCARP.

As in all disastrous earthquakes, the surface of the ground was scarred and rent by the shock. From the hillsides great landlips descended, filling the valleys



FIG. 6.—PLOUGHSHANE APPEARANCE OF THE FAULT NEAR FUJITANI. KOTO (6).

with *débris*; and slopes which were formerly green with forest, after the earthquake looked as if they had been painted yellowish-white. Innumerable fissures cut up the plains, the general appearance of the ground, according to Prof. Milne, being "as if gigantic ploughs, each cutting a trench from 3 to 12 feet deep, had been dragged up and down the river-banks." But by far the most remarkable feature of the earthquake was a great rent or fault, which, unlike the fissures just referred to, pursued its course regardless of valley, plain, or mountain. Although

at first sight quite insignificant in many places, and sometimes hardly visible to the untrained eye, Prof. Koto has succeeded in tracing this fault along the surface for a distance of 40 miles, and he gives good reasons for believing that its total length must be not less than 70 miles.

The general character of the fault-scarp changes with the surface features. On flat ground, where the throw is small, it cuts up the soft earth into enormous clods, or makes a rounded ridge from 1 to 2 feet high, so that it resembles, more than anything else, the pathway of a gigantic mole (Fig. 6). When the throw is considerable—and in one place it reaches from 18 to 20 feet—the fault-scarp forms a terrace, which from a distance has the appearance of a railway embankment (Fig. 7). Or, again, where the rent traverses a mountain ridge or a spur of hills,



FIG. 7.—THE FAULT-SCARP AT MIDORI. KOTO (6).

“it caused extensive landslips, one side of it descending considerably in level, carrying the forest with it, but with the trees complicatedly interlocked or prostrate on the ground.”

At its southern end, the fault was seen for the first time crossing a field near the village of Katabira. The field was broken into clods of earth, and swollen up to a height of $5\frac{1}{2}$ yards, while a great landslide had descended into it from an adjoining hill. A little further to the north-west, the ground was sharply cut by the fault, the north-east side having slightly subsided and at the same time been shifted horizontally through a distance of $3\frac{1}{4}$ to 4 feet to the north-west. Adjoining fields were formerly separated by straight mounds or ridges running north and south and east and west, and these mounds were cut through by the fault and displaced, as shown in Fig. 8. From this point the fault runs in a general north-westerly direction, the north-east side being always slightly lowered with respect to the other and shifted to the north-west. Near Seki it takes a more westerly direction, and continues so to a short distance east of Takatomi, where the north

side is lowered by 5 feet, and moved about $1\frac{1}{2}$ feet to the west. At the north end of Takatomi, a village in which every house was levelled with the ground, the fault is double, and the continuous lowering towards the north has converted a once level field into sloping ground. At this point, the small river Toba, flowing

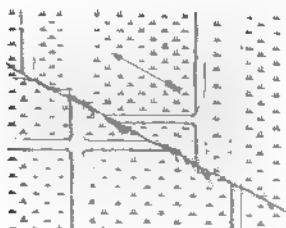


FIG. 8.—DISPLACEMENT OF FIELD DIVISIONS BY THE FAULT NEAR NISHI-KATABIRA. KOTO (6)

south, is partially blocked by the fault-scarp, and an area of about three-quarters of a square mile, on which two villages stand, was converted into a deep swamp (Fig. 9), so that, at the earthquake occurred at the time of the rice-harvest, the farmers were obliged to cut the grain from boats. After passing Takatomi, the fault again turns to the west-north-west, but, the throw being small, it resembles here the track of an enormous mole. At Umehara it crosses a garden between two persimmon trees, appearing on the hard face of the ground as a mere line; but the trees, which were before

in an east-and-west line, now stand in one running north and south, without being in the least affected by the movement (Fig. 10). From here to Kimbara, where the fault enters the Neo valley, the north side is always depressed and shifted eastwards by about $6\frac{1}{2}$ feet.

It was in the Neo valley that the supreme efforts of the earthquake were

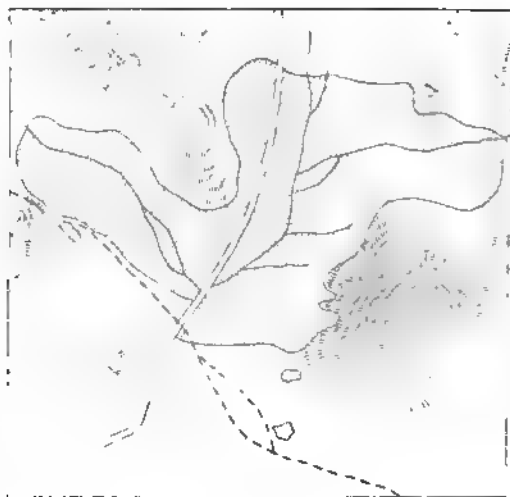


FIG. 9.—MAP OF SWAMP FORMED BY STOPPAGE OF RIVER TOBA BY FAULT-SCARP. KOTO (6).

manifested. Landslips were so numerous that the greater part of the mountain slopes had descended into the valley, the whole appearance of which had changed. "Unfamiliar obstacles," remarks Prof. Koto, "made themselves apparent, and small hills covered with forest had come into sight which had not been seen before." But the ground was not only lowered and shifted by the fault; it was permanently compressed, plots originally 48 feet in length afterwards measuring

only 30 feet. In fact, "it appears," in the words of Prof. Milne, "as if the whole Neo valley had become narrower."

A few miles after entering the Neo valley, the throw of the fault reaches its maximum at Midori. But instead of the relative depression of the east side, which prevails throughout the rest of the line, that side is here about 20 feet higher than the other. It is, however, shifted as usual towards the north by about 13 feet; and this displacement is rendered especially evident by the abrupt break in the line of a new road to Gifu (Fig. 7). That the east side has really risen is clear, for, a little higher up, the river has changed from a shallow rapid stream 30 yards wide into a small lake of more than twice the width, and so deep that a boatman's pole could not reach the bottom. At Itasho, about a mile north of Midori, both sides are nearly on the same level, the fault appearing like a mole's track; and 7 miles further, at Nagoshima, the east side is relatively depressed by more than a yard, and at the same time shifted about 6½ feet to the north.

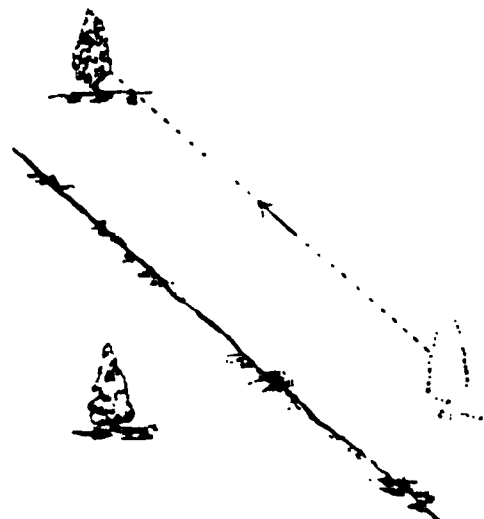


FIG. 10.—SHIFTING OF TREES BY FAULT AT UMÉHARA. KOTO (6).

At Nogo, the main Neo valley turns off at right angles to the east, and the fault continues its course up a side valley, the east side, with respect to the other, being continually depressed and shifted towards the north. It was traced by Prof. Koto through Fujitani (Fig. 6), where there were many unmistakable evidences of the violence of the shock, as far as the eastern shoulder of Haku-san; and here, after following the fault for 40 miles, the lateness of the season compelled him to return. There can be no doubt, however, that it runs as far as Minomata; and it is probable, from the linear extension of the meizoseismal area, that it does not entirely die out before reaching the city of Fukui, 70 miles from its starting-point at Katabira.

MINOR SHOCKS.

For some hours after the earthquake, shocks were so frequent in the meizoseismal area that the ground in places hardly ever ceased from trembling. Without instrumental aid, detailed record was of course impossible; but fortunately the buried seismographs at Gifu and Nagoya were uninjured, and in about seven hours both were once more in working order. To the energy by which this result was accomplished, we owe our most valuable registers of the after-shocks of a great earthquake.

Until the end of 1893, that is, in little more than two years, the total number of shocks recorded at Gifu was 3365, and at Nagoya 1298. None of these approached the principal earthquake in severity. Nevertheless, of the Gifu series, 10 were described as violent, and 97 strong; while of the remainder, 1808 were weak, 1041 feeble, and 409 were sounds alone without any accompanying shock. The slight intensity of most of the shocks is also evident from the inequality in the numbers recorded at Gifu and Nagoya, from which it appears that nearly two-thirds were imperceptible more than about 25 miles from the chief origin of the shocks. Only 70 of the after-shocks during the first two years were registered at Osaka, and not more than 30 at Tokio.

Distribution of After-shocks in Time.—The decline in frequency of the after-shocks was at first extremely rapid, the numbers recorded at Gifu during the six days after the earthquake being 303, 147, 116, 99, 92, and 81, and at Nagoya 185, 93, 79, 56, 30, and 31; in fact, half of the shocks up to the end of 1893 occurred

by November 23 at Gifu, and by November 6 at Nagoya. The daily numbers at these two places are represented in Fig. 11, in which the crosses correspond to the

numbers at Gifu, and the dots to those at Nagoya; and the curves drawn through or near the marks represent the average daily number of shocks from October 29 to November 20. It will be seen that these curves are hyperbolic in form, the change from very rapid to very gradual decline in frequency taking place from five to ten days after the great earthquake. Fig. 12 illustrates the distribution in time of the after-shocks at Gifu to the end of 1893, the ordinates in these cases representing the number of shocks during successive months.*

A similar rapid and then gradual decline in frequency characterizes the strong and weak shocks recorded at Gifu. Of the ten violent shocks, only one occurred after the beginning of January, 1892; and of the 97 strong shocks, only three after April, 1892. But at the commencement of the series, feeble shocks (i.e. shocks that could just be felt) and earth-sounds without any accompanying movement were comparatively rare, and did not become really prominent until two months had elapsed. Of the 308 after-shocks recorded in 1893, none could be described as strong, only 10 were weak, while 263 were feeble shocks and 35 merely earth-sounds.

The last two diagrams show at a glance that the decline in frequency of after-shocks is very far from being uniform. Some of the fluctuations are due to the occurrence of exceptionally strong shocks, each of which is followed by its

* Prof. Omori finds that the mean daily number of earthquakes (y) during the month x (reckoned from November, 1891) may be approximately represented by the equation—

$$y = \frac{16.9}{x + 0.397}$$

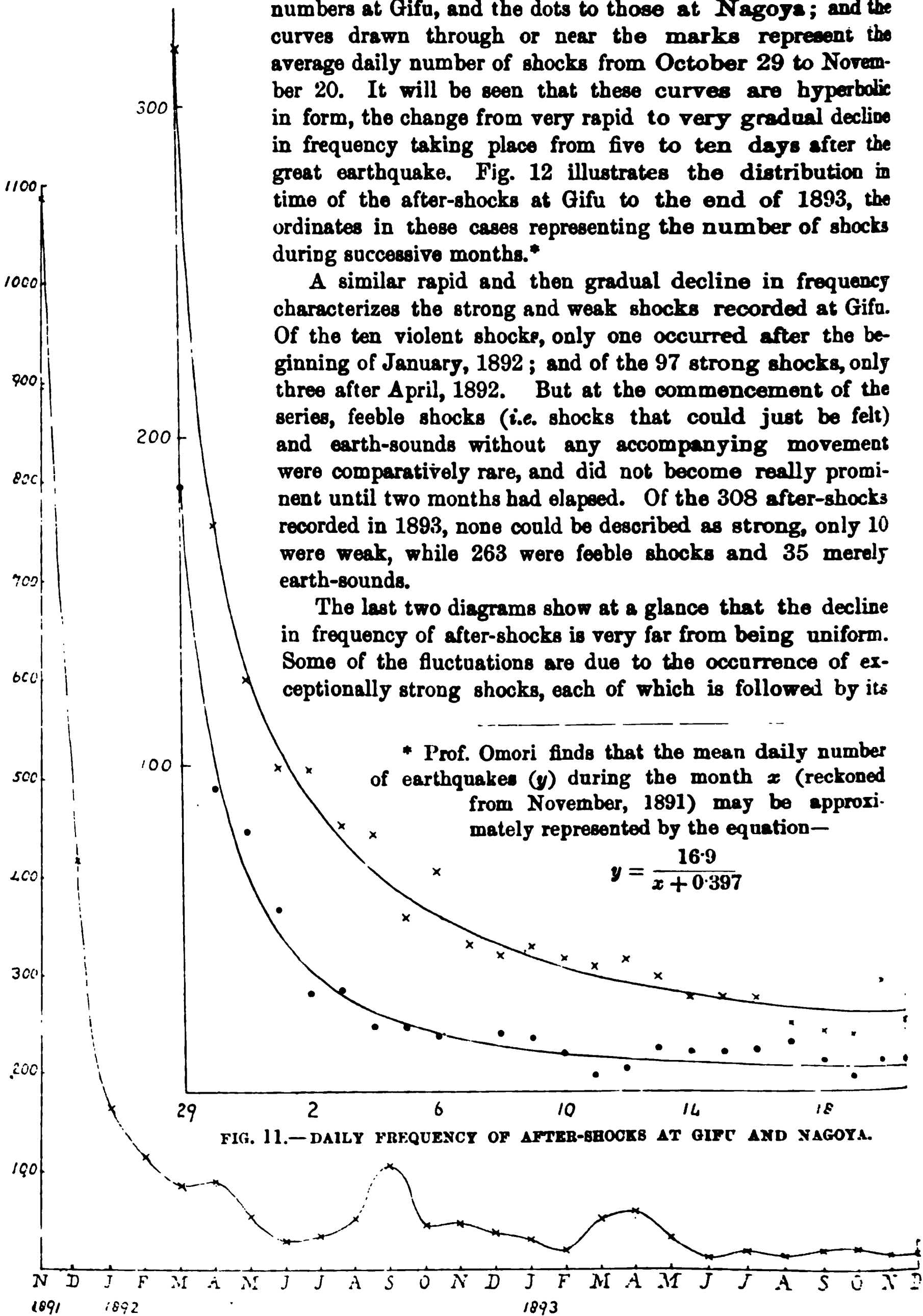


FIG. 11.—DAILY FREQUENCY OF AFTER-SHOCKS AT GIFU AND NAGOYA.

FIG. 12.—MONTHLY FREQUENCY OF AFTER-SHOCKS AT GIFU. OMORI (12).

own minor train of after-shocks.* Others seem to be periodic, and possibly owe their origin to external causes unconnected with the earthquake.†

Method of representing the Distribution of After-shocks in Space.—The maps in Figs. 14–17 show the distribution of the after-shocks in space during four successive intervals of two months each. They are founded on Prof. Milne's great catalogue of Japanese earthquakes, which give, among other data, the time of occurrence and the position of the epicentre for every shock until the end of 1892. For the latter purpose, the whole country is divided by north-south and east-west

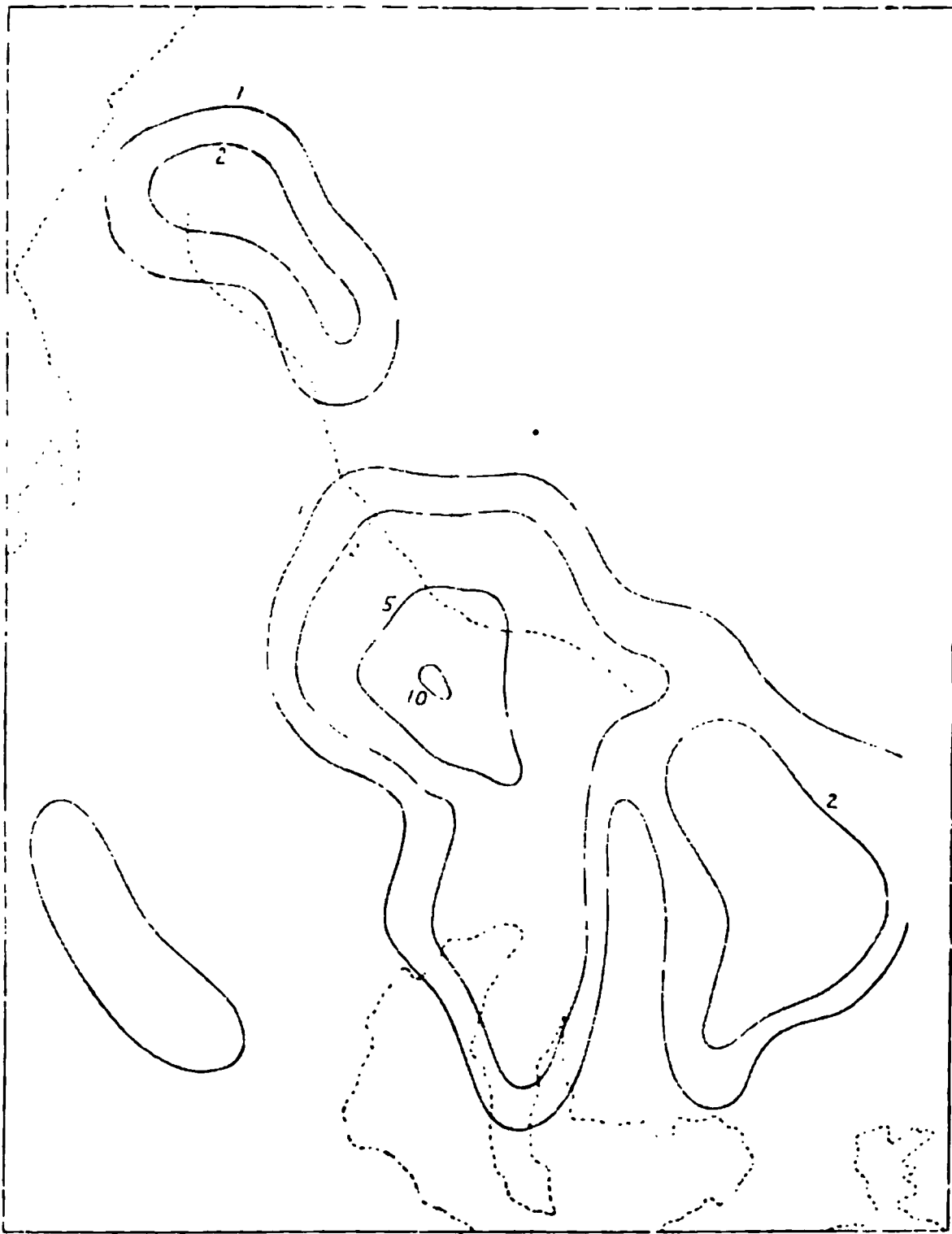


FIG. 13.—DISTRIBUTION OF PRELIMINARY SHOCKS IN SPACE. DAVISON (2).

lines into numbered rectangles, each one-sixth of a degree in length and breadth; and the position of an epicentre is denoted by the number of the rectangle in which it occurs. The area included within the maps is bounded by the parallels $34^{\circ} 40'$

* The last violent shock before the end of 1893 occurred on September 7, 1892, and its effects on the frequency of after-shocks is shown by the daily numbers recorded at Gifu during the first fortnight in September. These are—2, 2, 2, 3, 5, 5, 28 (on September 7), 8, 8, 5, 4, 3, 2, 4, 3.

† The periodicity of after-shocks is discussed in the papers numbered 4 and 12 at the end of this paper. There can be little doubt as to the existence of daily and other periods, but the results are not sufficiently established for inclusion here.

and $36^{\circ} 20'$ lat. N., and by the meridians $2^{\circ} 10'$ and $3^{\circ} 50'$ long. W. of Tokio, so that ten rectangles adjoin each side of the map. The number of rectangles lying within each rectangle having been counted, curves are then drawn through the centres of all rectangles containing the same number of epicentres, or through points which divide the line joining the centres of two rectangles in the proper proportion. Taking, for example, the curve marked 5, if the numbers in two consecutive rectangles are 3 and 7, the curve bisects the line joining their centres; if the numbers are 1 and 6, the line joining their centres is divided into five equal parts, and the curve passes through the first point of division reckoned from the

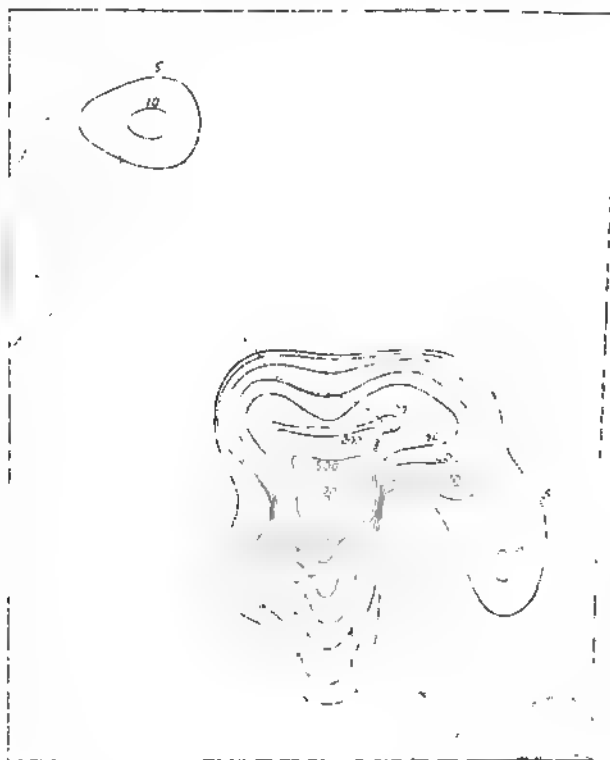


FIG. 14.—DISTRIBUTION OF AFTER-SHOCKS IN SPACE (NOVEMBER-DECEMBER, 1891).
DAVIDSON (2).

centre of the rectangle in which six epicentres are found. Thus the meaning of the curve marked, say, 5 may be stated as follows: Let any point in the curve be imagined as the centre of a rectangle whose sides are directed north-south and east-west, and are respectively one-sixth of a degree of latitude and longitude in length; then the number of epicentres within this rectangle is at the rate of 5 for the time considered.

Preparation for the Great Earthquake.—At first sight, there appears to have been but little direct preparation for the great earthquake. Except for a rather strong shock on October 25, at 9.14 p.m., it occurred without the warning of any preliminary tremors. But a closer examination of the evidence shows, as we should

indeed expect, that there was a distinct increase in activity for many months beforehand. The region had become "seismically sensitive." Of the hundred rectangles included in the maps in Figs. 13-17, there are thirteen lying along the meizoseismal area of the earthquake of 1891, in which nearly all the after-shocks originated. During the five years 1885-1889, 53 out of 125 earthquakes (or 42 per cent.) had their epicentres lying within the thirteen rectangles; or, in other words, the average frequency in one of the rectangles of the meizoseismal area was five times as great as in one of those outside it. In 1890 and 1891 (until October 27), the percentage in the thirteen rectangles rose to 61, and the average frequency in one of them to ten times that of one of the exterior rectangles.

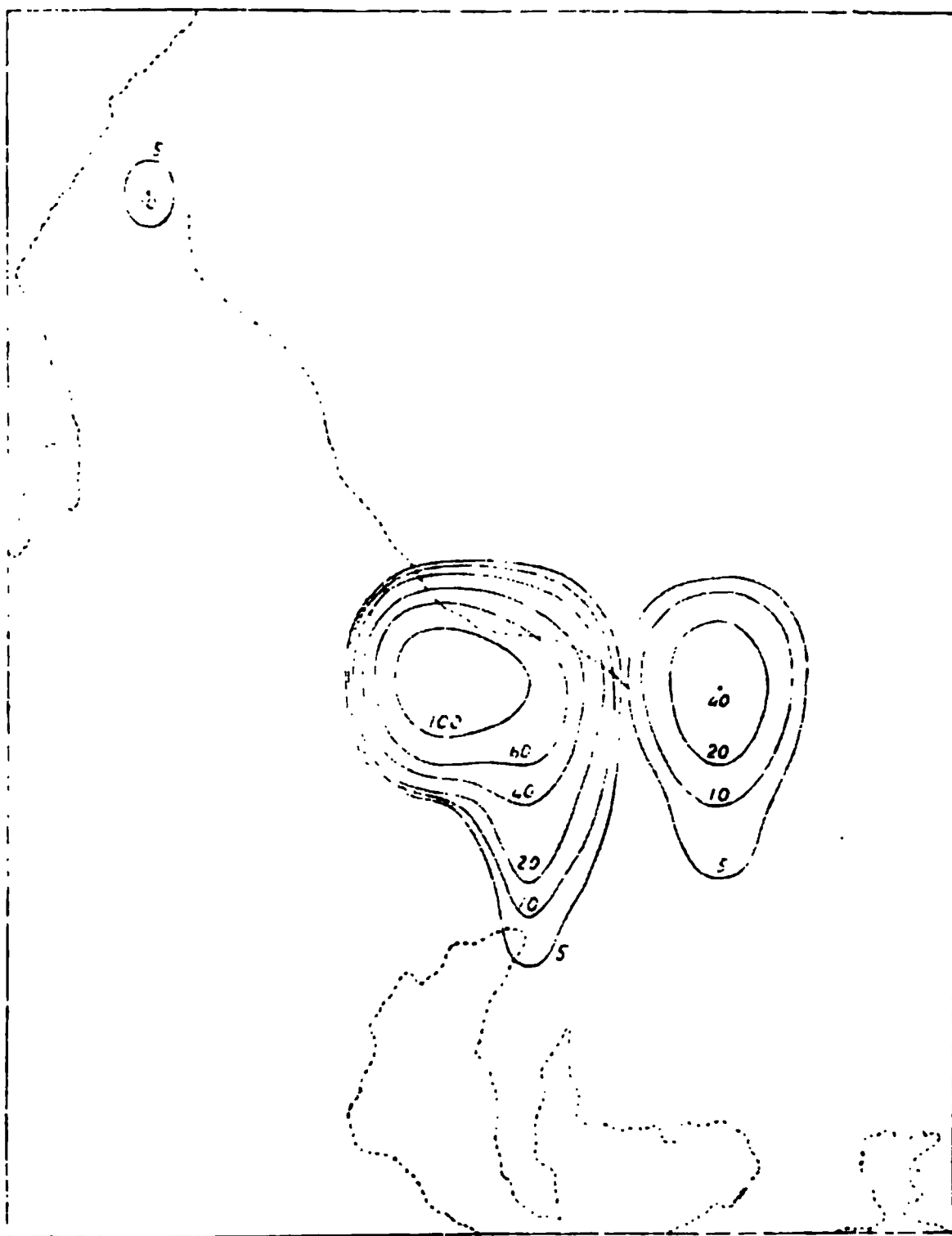


FIG. 15.—DISTRIBUTION OF AFTER-SHOCKS IN SPACE (JANUARY-FEBRUARY, 1892).
DAVISON (2).

The curves in Fig. 13 illustrate the distribution of epicentres during the latter interval. It will be seen that they follow roughly the course of the meizoseismal area southwards to the Sea of Isé, and that to the south-east they continue for several miles the short branch of the meizoseismal area which surrounds the southern end of the fault-scarp.

Thus the preparation for the great earthquake is shown, first, by the increased frequency of earthquakes originating within its meizoseismal area; and, secondly, by the uniformity in the distribution of epicentres throughout the same region,

the marked concentration of effort which characterizes the after-shocks being hardly perceptible during the years 1890–1891.

Distribution of After-shocks in Space.—We have seen that the after-shocks were subject to a fluctuating decline in frequency, rapid at first, and more gradual afterwards. It is evident, from Figs. 14–17, that a similar law governs the area within which the after-shocks originated. During the first two months, epicentres occur over nearly the whole of the meizoseismal area, but afterwards they are confined to a smaller district, which slowly, though not continually, decreases in size.

The most important feature in the distribution of the epicentres is the central

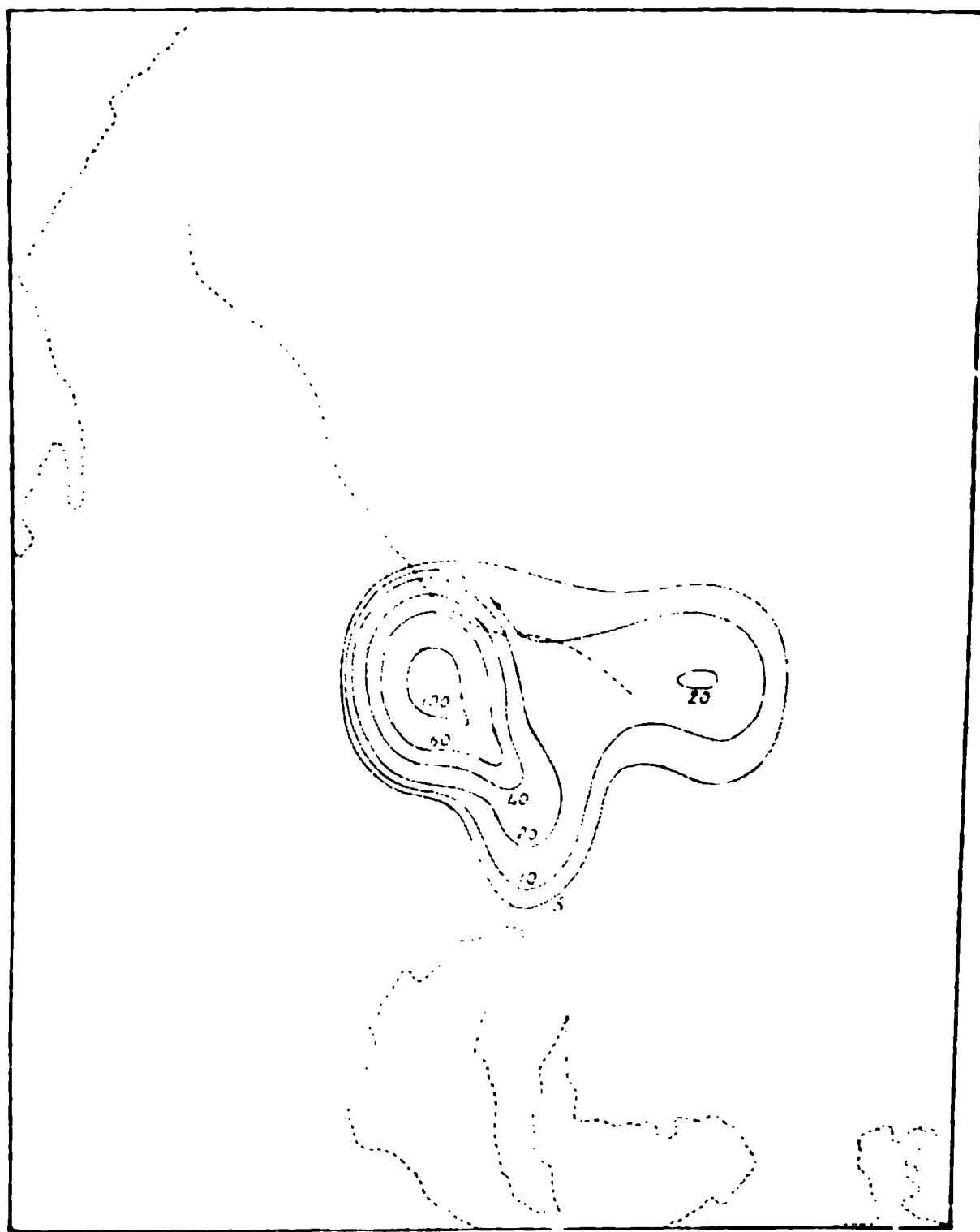


FIG. 16.—DISTRIBUTION OF AFTER-SHOCKS IN SPACE (MARCH–APRIL). DAVISON (2).

region of extraordinary activity; but there are also districts of minor and more short-lived activity near the three extremities of the meizoseismal band. The seat of chief seismic action shifts slightly from one part to another of the epicentral region, especially about the end of 1891, as will be seen by comparing the innermost curves of Figs. 14 and 15. Thus, with the decline in frequency of the after-shocks and the decrease in their sphere of action, there took place concurrently a gradual but oscillating withdrawal of that action to a more or less central region of the fault.

Sound-phenomena of After-shocks.—While comparatively few observers seem to have noticed any noise with the principal earthquake, many of the after-shocks

were accompanied by sounds. Prof. Omori describes them as belonging to two types. They were either rushing feeble noises like that of wind, or loud rumbling noises like those of thunder, the discharge of a gun, or the fall of a heavy body. In the Neo valley, sounds of the second type were most frequent and distinct, but they either occurred without any shock at all, or the attendant tremor was very feeble; while, on the other hand, severe sharp shocks were generally unaccompanied by distinctly audible sounds.

It is remarkable, also, that sounds were less frequently heard with the early than with the later after-shocks. In November, 1891, the percentage of audible shocks was 17, and from December to the following April always lay between 10

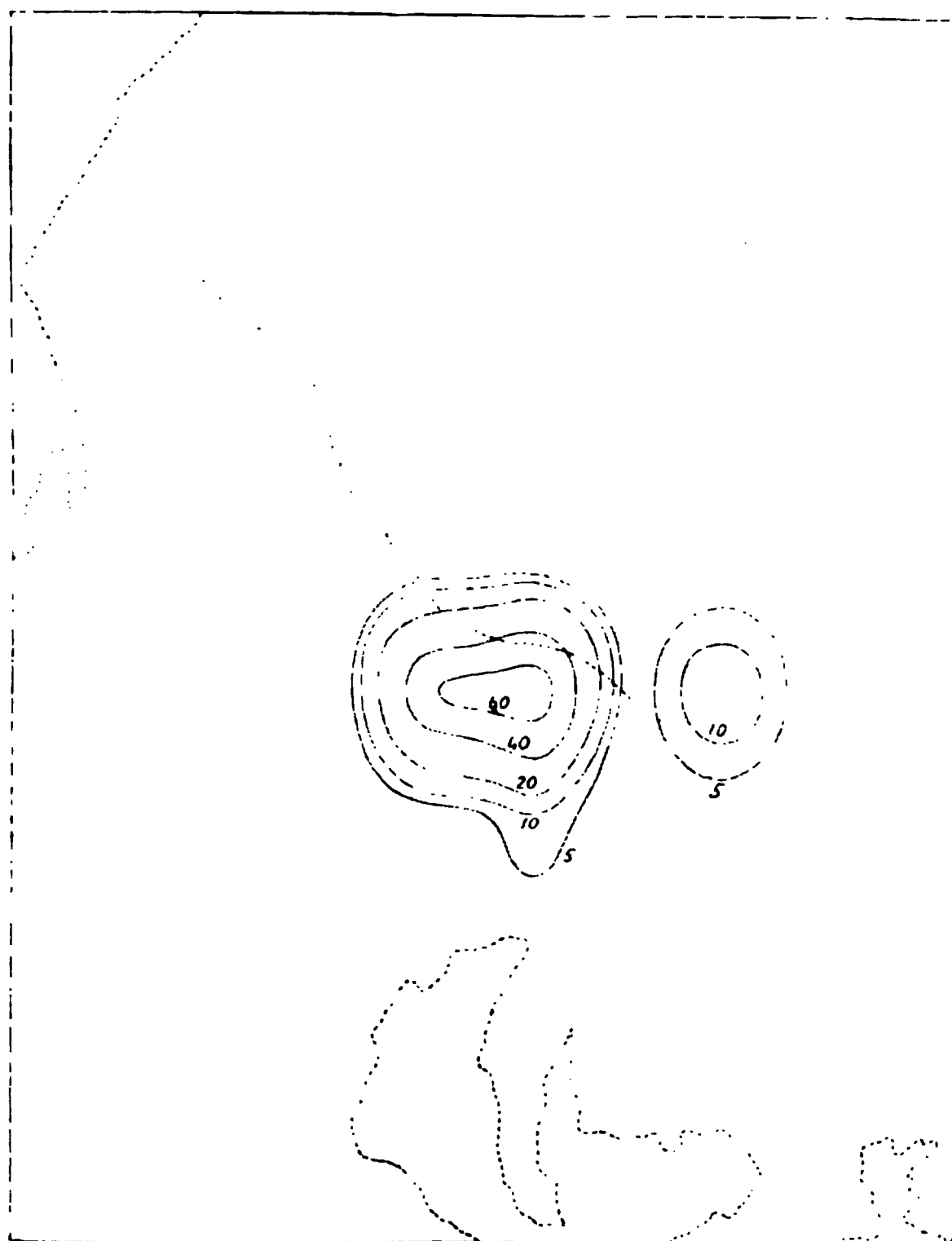


FIG. 17.—DISTRIBUTION OF AFTER-SHOCKS IN SPACE (MAY-JUNE, 1892). DAVISON (2).

and 12. In May the percentage suddenly rose to 39, and until the end of 1892 was always greater than 32, while in November, 1892, it rose as high as 49. This, of course, agrees with Prof. Omori's observation that sounds attended feeble shocks more often than strong ones.

The distribution of the audible after-shocks in space is shown in Fig. 18. These curves are drawn in the same way as those in Figs. 13-17, but they represent the percentages, not the actual numbers, of shocks accompanied by sound. It will be noticed that all three groups of curves lie along the meizoseismal area, or the continuation of the south-east branch; while the axis of the principal group of curves lies to the west of the central regions in which most after-shocks originated.

The explanation of these peculiarities is no doubt connected with the comparative inability of the Japanese people to perceive the deep sounds which in Europe are always heard with earthquake shocks. The sounds are rarely heard by them more than a few miles from the epicentre.* We may therefore conclude that slight after-shocks originated nearer the surface than strong ones, that the mean depth of the foci decreased with the lapse of time, and that the axes of the systems of curves in Fig. 18 mark out approximately the lines of the growing



FIG. 18.—DISTRIBUTION OF AUDIBLE AFTER-SHOCKS IN SPACE (NOVEMBER, 1891-DECEMBER, 1892). DAVISON (3).

faults. The separation of the two westerly groups of curves appears to show that the main branch of the meizoseismal area is connected with a fault roughly parallel to that traced by Prof. Koto, but of which no scarp (if it existed) could be readily distinguished among the superficial fissures produced by the great shock.

* Of the Japanese earthquakes of 1885-1892 originating beneath the land, 26 per cent. were accompanied by a recorded sound; but less than 1 per cent. of those originating beneath the sea and not more than 10 miles from the coast.

EFFECT OF THE EARTHQUAKE ON THE SEISMIC ACTIVITY OF THE ADJOINING DISTRICTS.

So great and sudden a displacement as occurred along the fault-scarp could hardly take place without affecting the stability of adjoining regions of the earth's crust, and we should naturally expect to find a distinct change in their seismic activity shortly after October 28. In Fig. 19 two such regions are shown, bounded by the straight dotted lines. The district in which the principal earthquake and its after-shocks originated is enclosed within the undulating dotted lines. The continuous lines inside all three districts are the curves corresponding to 10 and 5 epicentres for the years 1885-1892. Not far from the axes of the outer groups of curves there are probably transverse faults, approximately parallel to the great fault-scarp and the main branch of the meizoseismal band, and distant from them about 45 and 55 miles respectively.

In the district represented in the north-east corner of Fig. 19, 29 earthquakes originated between January 1, 1885, and October 27, 1891, and 30 between October 28, 1891, and December 31, 1892, 7 of the latter number occurring in November, 1891. In the south-west district, the corresponding figures before and after the earthquake are 20 and 36, 8 of the latter occurring in November, 1891. Thus, in the north-east district, for every shock in the interval before the great earthquake there were six in an equal time afterwards, and at the rate of 10 during November, 1891; and in the south-west district, for every shock before the earthquake there were 10 afterwards, and at the rate of 16 during November, 1891.

Now, it is unlikely that the gradual increase of stress should be so nearly proportioned everywhere to the prevailing conditions of resistance as to give rise to a marked and practically simultaneous change in seismic activity over a large area; whereas the paroxysmal occurrence of a strong earthquake might alter the surrounding conditions with comparative rapidity, and so induce a state of seismic excitement in the neighbourhood. It therefore seems very probable that the increased activity in the two districts here described was a direct consequence of the occurrence of the great earthquake.

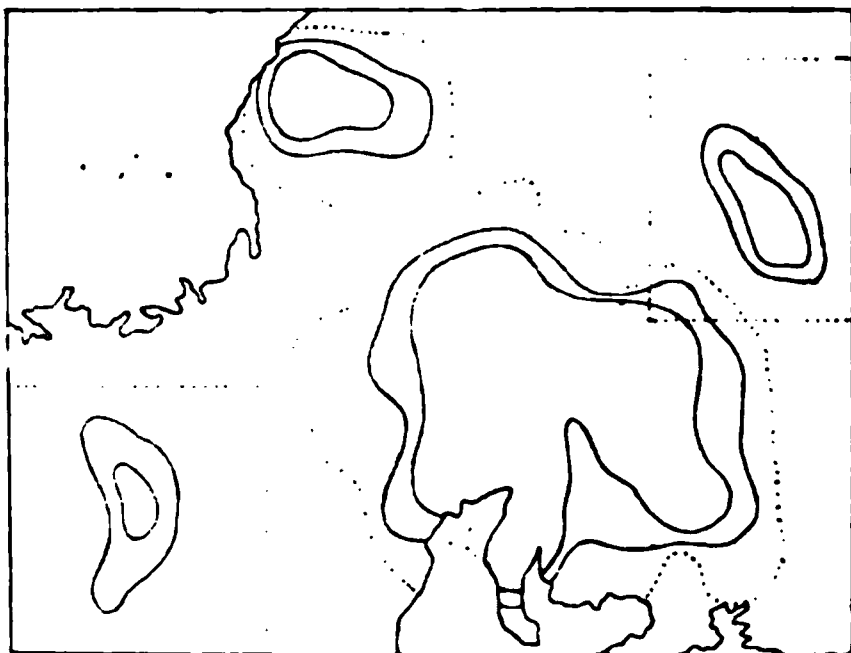


FIG. 19.—MAP OF ADJOINING REGIONS IN WHICH SEISMIC ACTIVITY WAS AFFECTED BY THE GREAT EARTHQUAKE. DAVISON (3).

ORIGIN OF THE EARTHQUAKE.

The preponderance of preliminary earthquakes within the meizoseismal area and the outlining of the fault-system by the frequency curves of 1890-1891 (Fig. 13) point to the previous existence of the originating fault or faults, and to the earthquake being due, not to the formation of a new fracture, as has been suggested, but to the growth of an old fault.

The last severe earthquake in the Mino-Owari plain occurred in 1859, so that for more than thirty years there had been but little relief to the gradually increasing stresses. Now, the distribution of stress must have been far from uniform throughout the fault-system, and also the resistance to displacement far from proportional

to the stresses at different places. At certain points, therefore, the effective stress would be greater than elsewhere, and it would be at these points that fault-slips would first occur. Such slips tend to remove the inequalities in effective stress. Thus, the function of the slight shocks of 1890 and 1891 was, briefly, to equalize the effective stress over the whole fault-system, and so to clear the way for one or more great slips throughout its entire length.

As to which side of the fault moved during the great displacement, or whether both sides moved at once, we have no direct evidence but as regards the neighbourhood of Midori, and there the conditions were exceptional. Prof. Koto thinks that it was probably the rock on the north-east side that was generally depressed and always shifted to the north-west. But the disturbance in reality seems to have been more complicated. That this was the case, that displacement occurred along more than one fault, is probable from the branching of the meizoseismal area, the isolation of the audibility curves of the after-shocks (Fig. 18), and the sudden increase in seismic activity both to the north-east and south-west of the epicentre. The detached portion of the meizoseismal area near Lake Biwa may also point to a separate focus. The whole region, indeed, was evidently subjected to intense stresses, and the depression on the north-east side of the fault-scarp can hardly fail to have been accompanied by other movements, especially along a fault running near the western margin of the main branch of the meizoseismal area.

The later stages of the movements are somewhat clearer. From a study of the after-shocks, we learn that the disturbed masses began at once to settle back towards the position of equilibrium. At first the slips were numerous and took place over the whole fault-system, but chiefly at a considerable depth, where no doubt the initial displacement was greatest. After a few months, stability was nearly restored along the extremities of the faults; slips were confined almost entirely to the central regions, while a much larger proportion of them took place within the superficial portions of the faults.

The official records bring down the history to the end of 1893. Since that time more than one strong shock has been felt in the Mino-Owari plain; but the stage of recovery from the disturbances of 1891 is probably nearly or quite at an end, and we seem rather to be entering on a period in which the forces are once more silently gathering that sooner or later will result in another great catastrophe.

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THE MONTHLY RECORD.

EUROPE.

The River Spey.—Some interesting questions connected with the geological history of the river Spey are touched upon in the April number of the *Scottish Geographical Magazine* by Mr. L. W. Hinxman of the Geological Survey. After pointing out that the southern tributaries, flowing as they do from a more mountainous and humid region than those on the north, have been able to cut a long way back into the original plateau, and thus drain a larger area, the writer points out a striking example of river-capture in the case of the upper Feshie, one of the largest tributaries of the Spey. For the first 6 miles of its course the Feshie flows to the east, but on touching the boundary between the counties of Aberdeen and Inverness, suddenly bends round and flows in a directly opposite direction. The watershed towards the Dee is here only a few feet above the bed of the stream, and to the east is a wide peat-filled valley, down which the upper Feshie must once have flowed. The Eldart, which joins the Feshie a mile below the bend, was once the headstream of that river. Mr. Hinxman next points out that the profile of the course of the Spey is very far from being that of an orthodox river, and that its total fall is less than that of the Dee or Tay. It is

divided into three well-marked sections of unequal length, the uppermost of which has a fairly steep but uneven slope; the second is gently inclined throughout; and the lowest falls steeply and evenly to the sea at the average rate of 14 feet per mile. The middle section contains three nearly horizontal portions, indicating the position of three basins formerly occupied by lakes, but now drained by the gradual lowering of the barriers. Throughout almost the whole of this section the river is cutting through a flood plain composed of the materials deposited at former periods, while during the last 40 miles it is flowing through solid rock, and is still deepening its bed. These unusual phenomena may perhaps be explained as the effect of an elevation of the land along an axis running north and south somewhere about Grantown, which would diminish the slope on the upper and increase it on the lower side. On the latter the river has been rejuvenated, and is both younger in age and steeper in gradient than in the higher portions. In summarizing the geological history of the river, the writer shows that in the glacial period, when the Glen Roy and Glen Spean lakes were dammed back by glacier ice, much of the water that now flows westward to the Atlantic must have swelled the volume of the Spey, the watershed between the Pattack and the Mashie water being 7 feet lower than the terraces corresponding to the lowest lakes. There are also other features in the valley of the Spey that may be attributed to the later phases of the glacial period.

Early Intercourse between Italy and Scandinavia.—The latest volume of the *Journal of the Anthropological Institute* (vol. xxx., 1900) contains the report of a paper read last year by Prof. Montelius, in which that *savant* discussed the question of former intercourse between Italy and Scandinavia, as evidenced by the antiquities in the form of bronzes, etc., manufactured in Italy, which are met with in considerable numbers in the northern country. The lecturer's main point, in which his views differ somewhat from those of other writers on the subject, was that the successive styles of bronzes were in use contemporaneously in Italy and Scandinavia. While common in Austria, Germany, and Scandinavia, such objects are surprisingly rare in Western Europe. The route followed by the early commerce, by which they were imported can thus be traced, it being the same as was followed by the amber trade from Denmark and North Germany to Southern Europe. Prof. Montelius points out that the time required for the transit was extremely short, and though the actual time occupied cannot of course be laid down, it would have been possible for an object to make the journey in anything from six months to two years. Many of the bronzes date from the middle of the first millennium B.C., and Prof. Montelius even traces back the southern influence in Scandinavia to a date within the third millennium.

ASIA.

Exploration of the Dihong.—We have received from Mr. J. F. Needham a further account of the attempt made under his auspices to explore the unknown course of the Dihong between Assam and Gyala Sindong in Tibet (*ante*, p. 525). The surveyors returned to Sadiya on April 7, unsuccessful as regards the main object of their journey, but having accomplished something in the way of mapping the country for a certain distance along the right bank of the river. Once more the opposition of the Passi Minyongs proved an insurmountable obstacle, though Mr. Needham says that the surveyors arrived at Sadiya much too late in the season to admit of much hope of success. The lateness of the season was in fact one of the reasons urged by the villagers for refusing to grant a passage, another being that a feud was at the time in progress between two of the villages *en route*. Starting from Sadiya, as before mentioned, on March 18, the surveyors took six

days to reach the Minyong village of Renging, on the right bank of the Dihong, a day's journey above Passi-Ghat. This village lies just inside the gorge of the Dihong, and is about half a day's journey from the river-bank, the ghat itself being known as Janak. The path hence to the village is very steep and jungly, and the transport of the supplies, presents, etc., took a whole day. At Renging, as at other villages passed later, a pig was killed in honour of the visitors, and a divination made with its liver. Two days were spent here and one at Rotung, the next village on the route, whence the party marched through Babuk to Kebang, the limit of the journey, which was reached on March 30, or thirteen days after leaving Sadiya. The return journey to Passi Ghat occupied three days, and on the first of these a disaster befel the party, the chief "Kotoki"—a man of great energy who had been Mr. Needham's factotum for eighteen years—receiving fatal injuries from a fall down a sheer precipice. His loss, Mr. Needham says, will be irreparable. The surveyors mapped in 40 square miles of country and saw 50 miles of the river inside the gorge. They also proved the correctness of Mr. Needham's information respecting the approximate distance to Gyala Sindong, and the character of the country and its inhabitants. The country presents no difficulties beyond Kebang, while the first civilized people met with are the Tibetans, known to the hill tribes to the south of them as Bori or Memba. For some 20 miles before reaching the gorge at Pangi-Ghat the river flows nearly due east, and above this, for some 40 or 50 miles, comes from the north-north-west. Numerous Passi-Minyong villages were seen to the north, and the position of Pangkang could also be made out in the distance. The surveyors had a trying time among the villagers, and one of them, who though a vegetarian was several times forced to partake of pigs' livers as a guarantee of good faith, declines to pay a second visit to the country. The other is willing to make another attempt, and Mr. Needham hopes to obtain two more men and to return to the task next November. He proposes holding a huge "darbar," at which he may be able to interview a large number of Passi-Minyong "gams," and by his knowledge of their language to persuade them that they have nothing to fear in giving access to their hills.

Surveys in Ceylon, 1899.—We learn from Mr. F. H. Grinlinton's Report that survey operations in Ceylon during 1899 have made good progress. The total outturn of work for the year is given as 2,372,450 acres as compared with 1,255,004 acres in 1898. The topographical survey embraced the whole of the mainland of the Northern Province and most of the North-Central Province north of Anuradhapura, an area of 3324 square miles. A noteworthy feature of the year's survey is the discovery of a remarkable number of tanks which might be used for irrigation purposes to the immense benefit of the Northern Province. Many of these tanks are said to be supplied from reservoirs formed by damming up the numerous streams, or by channels direct from the rivers. Cadastral surveys were continued, the outturn for the year being 210,862 acres. Progress has been made in triangulation work in the Central, Uva, North-Western, Southern, and Sabaragamuwa Provinces: 75 stations have been placed on the "new fixing." A number of miscellaneous surveys have also been conducted. Excluding isolated surveys, the area mapped in the last three years is given as 5786 square miles, or nearly one-fourth of the island.

The Projected French Yunnan Railway.—The *Dépêche Coloniale* devotes practically the whole of its issue for April 9 to a discussion of the project, now apparently taking definite shape in France, for the prolongation of the Tongking railways into Yunnan, so as to tap the trade of that province and checkmate the attempts on the part of Great Britain to secure such trade by the prolongation of the line, now almost completed, to the Kunlong ferry. The writer of the

article dilates on the political advantages to be derived from such a line, as well as on the great natural riches and healthy climate of Yunnan. Although the scheme now in view is restricted for the time being to a line to Yunnan-fu, its projectors have taken into consideration its ultimate extension to Sui-fu and Chung-king, with a branch to Cheng-tu, for the purpose of diverting to Tongking the trade of Sechuen, which now finds its way down the Yang-tse. The writer foresees the objection that the union of Yunnan with the Yang-tse might, instead of attracting the Sechuen trade southwards through Yunnan, tend to divert the Yunnan trade northwards to the Yang-tse. But he considers that the rapids between Chungking and Ichang will be a sufficient safeguard against such a result. The paper ends with a statement of the practical steps which have already been taken towards the accomplishment of the project, and especially the surveys carried out since 1897 by M. Guillemoto and his staff of assistants. These have thoroughly examined the country along the line of route, and drawn up a scheme which has met with the approval of M. Doumer, Governor of French Indo-China, who, it is said, hopes to make arrangements for the execution of the enterprise during his stay in France. The paper is accompanied by a map, which shows, in addition to the Yunnan line, the sections open or under construction of the projected line along the coast of French Indo-China, from Saigon to Hanoi.

A Feature Line of East Asia.—An arc of a great circle joining the equator at 95° E. to 60° N. at 175° W. passes near Ichang, Paoting, Tsitsikhar, and Okhotsk. Along it the land falls from the Central Asian plateau in a series of steps, convex to the south-east. These terraces lie either W.S.W. to E.N.E., or S. by W. to N. by E., and these directions occur alternately. They are clearly marked on any good map, and, beginning in the north from (1) the eastern and southern boundary of the Kolima basin (North Stanovoi mountains); (2) the eastern and southern boundary of the Lena basin (South Stanovoi mountains); (3) the eastern and southern boundary of Mongolia (Khingan mountains); (4) the eastern and southern boundary of South Shansi (Taihang-shan); (5) the eastern and southern boundary of Honan; (6) the eastern and southern boundary of Kweichau, and (7) the eastern and southern border of Yunnan. This zigzag line is not merely morphological, but hydrographical, climatic, and economic. Baron Richthofen has recently described and attempted to account for these stepped faults in a communication to the Prussian Academy of Sciences (*Sitzungsberichte*, 1900, xl.), in which he points out that the east-and-west lines correspond with the strike of the structure lines of the region they bound, while the meridional lines do not, but in some places cut acutely across the fold axis. Suess has declared that the plan of the Asiatic system of folds was laid down in pre-Cambrian times, and von Richthofen believes these east-and-west lines may have begun to be formed in the oldest times, at least north of the Tsingling-shan. The meridional fractures, however, cannot be as old as Carboniferous, and are probably not so old as Triassic times, and were caused by a shrinkage of the crust of the Earth towards the Pacific along its Asiatic margin.

Mr. Turley's Map of Manchuria.—Writing from Niuchwang in October last, Mr. R. T. Turley replies to the criticisms of Colonel Browne (*Journal*, vol. xv. p. 654) respecting the map of Central and Southern Manchuria published in the *Journal* for September, 1899. In nearly every instance, Mr. Turley says, Colonel Browne's remarks are incorrect, though the mistakes are such as might easily be made by a casual visitor not speaking the language. The roads shown on the map are right in each case, Colonel Browne referring to mule-tracks which he traversed after the rainy season, while Mr. Turley gave the great winter trade-routes for cart traffic. It is a common mistake, he says, to imagine that the

Great Wall at Shan Hai Kwan is the boundary between Chih-li province and Manchuria, whereas the Chih-li jurisdiction in reality extends for some distance on the east of the wall. The governor of Kirin is responsible for the imperial road as far as the gateway known as Wei Yuan Pu nien (gate), or Wu Yuan Pu, near Kai Yuan city, but the country on either side at a short distance from the road is entirely under the Mukden governor, and this for a long distance north-east. The south-east boundary of Kirin province is practically as shown in the map. The unsettled and wild regions are nominally under Kirin, but as the areas are opened and settled from the south, they pass under the civil government of Mukden. With regard to the river mentioned by Colonel Browne as joining the Yi-tung-ho south of Neng-an-Chŭng (called also, incorrectly, Lung-wang-Chŭng), Mr. Turley remarks that the Hsin-Kai-ho is in reality a large marsh with a small stream through it. This spreads out after the rains into a small lake, which is forded by pack-mules at the season when Colonel Browne crossed it, but for nine months in the year is almost dry. Mr. Turley allows that there are not a few small mistakes in the map, and in particular the mouth of the Yalu, taken from the Admiralty chart, is very much out, the west bank in reality extending further south. He hopes, however, to correct these mistakes in course of time, though during the recent troubles he has lost a large amount of scientific material.

AFRICA.

Scientific Results of the Lemaire Mission.—The twelfth number of the *Mouvement Géographique* for the present year contains a preliminary statement as to the scientific results of the Lemaire expedition to Katanga, on the working up of which the leader has been engaged since his return to Belgium. The section dealing with the astronomical and magnetic observations and the measures of altitudes, which is almost ready for publication, will contain, in addition to a statement of results, a full account of the methods employed, and a reproduction of the observations and calculations on which the results are based. Altogether astronomical observations were taken at 195 separate stations, and at sixteen of these the longitude was fixed by lunar culminations. At two of the latter the routes followed by the expedition intersected, thus giving an additional control over the intervening positions. The following table gives the positions and altitudes of some of the more important points:—

Place.	Latitude.			Longitude.			Altitude.
	°	'	"	°	'	"	
Moliro (Tanganyika)	8	14	17.52	30	34	59.07	2680
Mpweto (Mweru) ...	8	28	32.70	28	52	55.54	3202
Lofoi '	10	11	43.74	27	25	23.86	2953
Lake Dilolo	11	30	3.08	22	2	39.74	3610
Mtowa (Tanganyika)	5	42	59.29	29	22	39.96	2674
Kasongo	4	31	36.75	26	36	30.14	—

In each of these there is a considerable shifting to the west as compared with existing maps, though in a varying degree. The position assigned to the west shore of Tanganyika agrees well with those of Mr. Fergusson and Major Gibbons. By a number of observations at three stations on Tanganyika, Captain Lemaire obtained figures for the altitude of the lake-surface varying between 2526 feet (Mtowa, May, 1900) and 2572 feet (Mpala, April, 1900). Even the latter is considerably less than values obtained by other travellers, which have varied between 2608 feet (Thomson) and 2756 feet (Stanley). This is explained in the

Mouvement by the recent fall of the lake-level; but such fall is surely insufficient to account for more than the difference between Captain Lemaire's highest, and the previous lowest figure. For Mweru an altitude of 3117 feet was observed, which differs in the opposite direction from figures previously given, former travellers having almost always placed the lake below 3000 feet (Sharpe 2900, by aneroid only). Lake Dilolo, on the contrary, is placed more than 1000 feet lower than by Livingstone or Cameron. The magnetic observations should prove of much interest, determinations of the three magnetic elements having been made at 117 stations. Near the west coast they indicate a secular variation of 6' during the last twenty years of the nineteenth century, as compared with 6' 14" at Brussels.

Surveys in French Congo.—The results of various French expeditions which have improved our knowledge of parts of French Congo and adjacent regions have lately been published. The February number of *La Géographie* gives a map showing a portion of the surveys executed in 1899 by Captain Julien and his staff to the north of the middle course of the Ubangi from the Mbomu westward. Captain Julien's force was originally intended to reinforce Major Marchand, but, after the evacuation of Fashoda, was placed at the disposal of the administrator of the Shari, making its way to that region by new routes. The country traversed, away from the main rivers, consists largely of plateaux of varying altitude, the lines of partition between the river-basins being but slightly marked. The surface is generally either cultivated or covered with bush, forests worthy of the name being rarely seen. Granite, schists, and sandstones are the commonest rocks. The principal tribes represented are the Dendis, or "river-people," the Nsakarass, and the Bugbus. The last named are essentially cultivators, and give the most promise of future improvement, the Nsakarass being a more turbulent race which has gained the country east of the Kota by conquest. In the March number of *La Géographie* an account is given of the work of a section of the Gendron Mission, which during 1899 and 1900 executed important surveys in the region, somewhat neglected of late, between the Ogowe and the Congo, for which the work of De Brazza and Mizon was previously the chief basis of our maps. The leader of this section, Lieut. Jobit, who has already been referred to in the *Journal* for his surveys further inland (*ante*, p. 73), carried, with the help of his assistants, three lines of survey between the Ngunyi, the southern tributary of the Ogowe, and the Alima. The most northern of these crossed, in part through uninhabited forest, various southern tributaries of the Ogowe, of which one of the most important is the Lolo. It flows with a rapid course through a mountainous country in which the thermometer fell to 50° at night, and which seems favourable for European residence. The limit of the forest region of the west coast was found to run some 25 miles west of the upper Ogowe, though a limited area of forest occurs again near that stream. It was found that the Libumbi, which since Du Chaillu's time has been shown with a course from west to east, in reality shares in the meridional direction characteristic of the streams of this region. Lieut. Jobit considers that the special value of this part of French Congo, hitherto left somewhat out of sight, consists in the fact that the native tribes show an unusual readiness to work. Lastly, though in part passing beyond the limits of French territory, the work of Captain Roulet between the Congo and Nile deserves mention. This officer was another of those despatched in support of the Marchand expedition, and before the evacuation by the French of the Bahr-el-Ghazal, did much good work in that region, which he traversed in various directions, reaching the Nile at Gaba Shambe. Besides surveying some 1200 miles of routes, he carried out a large number of astronomical observations. In a paper lately read before the Paris Geographical Society (*La Géographie*, 1901, p. 221), Captain Roulet called attention to the important influence on the fertility of Egypt

exercised by the Bahr-el-Ghazal, the level nature of the country keeping back the flood water and so regulating the overflow, while many of the fertilizing ingredients may be derived from the products of the annual grass burnings in the Bahr-el-Ghazal.

Surveys in the Ivory Coast.—The western borderlands of the Ivory Coast have lately been surveyed by a French officer, Lieut. Dromard, who has, however, succumbed to a bilious fever, the effect of the hardships undergone in the bush, since his return to France. A map showing the results of his surveys is published in the April number of *La Géographie*. Lieut. Dromard's numerous routes traversed the country to the east of the lower Kavalli, and resulted in defining the eastern limit of the basin of that river, which here adjoins that of the Tabu. The whole region is said to have a fertile soil.

The Southern Nigeria Protectorate.—With the taking over of the Royal Niger Company's territories by the British Government on January 1, 1900 (notified in the *Geographical Journal*, vol. xv., 1900, p. 281), the Niger Coast Protectorate has received an extension of area, and has been renamed "Southern Nigeria." Major Gallwey, in his report for 1899–1900 (Colonial Reports, Annual), refers to the important changes in the establishment consequent on this addition of territory, the details of which will be dealt with in a future report. The general condition of the Protectorate is said to be very satisfactory. A decrease is recorded in imports and an increase in exports during the year, palm kernels and palm oil continuing to be the principal items in the latter. The amount of rubber and cocoa exported showed an increase over that of last year, while coffee and ebony decreased, the latter by more than 74 per cent. The exportation of timber from the Protectorate is pointed out as a new feature, and, although the industry practically only started in August, 1899, 23,983 superficial feet were exported. Trade with the United Kingdom continued on the increase, and during the year a direct trade was carried on with the United States. A Forestry Department has recently been formed, and has commenced an important work in dealing with the preservation of the extensive rubber forests in the Benin territories. With the taking over of the Niger territories, an immense addition was made to the length of waterways to be controlled by the Marine Department; these now include the lower portion of the river Niger as far north as Idah, Oguta lake, and its connections with the Niger, and the Anambara, Ase, and other creeks connecting the Nun and Warri branches of that river. An accelerated mail and passenger service was established during the year, the journey from Plymouth to Old Calabar being reduced to twenty-two days. A perfect system of canals exists throughout the Protectorate, with the exception of the country between the Kwa Ibo and Cross rivers. By these means launches can travel from Opobo to Sapele without going out to sea. The average resident European population during the year was approximately 270, an increase of 43 on the previous year.

New Expeditions in West Africa.—The departure of two or three new exploring expeditions in West Africa has recently been announced. In French Congo, Captain Loeffler has set out from Carnot, on the Sanga, for Lake Chad, by the valley of the Logone, the great tributary of the Shari; while M. Fredon will endeavour to explore the Bali, crossed by MM. Huot and Bernard, east of the Sanga. In the Cameroons, Captain Schimmelpfennig, in command of a military expedition, hopes to explore the unknown districts south of the Manenguba range (about 5° N.). On the Niger, the French expedition, under Captain Lenfant, for the transport of supplies to the Sudan, has successfully effected the transshipment to the river flotilla, which reached Lokoja on March 13.

AMERICA.

The Cascade Mountains, Washington State.—As a result of our carried out, principally in 1897 and 1898, on behalf of the U.S. Geological Survey Dr. Israel C. Russell contributes to the twentieth annual report of that Survey a lucid description of the physical geography and geology of the northern part of the Cascade mountains in Northern Washington. The memoir, which has also been issued separately, begins with a sketch of the climate, vegetation, and drainage of the Cascades, special attention being drawn to the marked differences which exist between the eastern and western versants of the range, and which the author thinks have persisted through several geological epochs. On the west, with a high precipitation and generally misty atmosphere, there are really dense forests, a matted undergrowth and a general scarcity of grass. On the eastern, or outside, days of cloud or fog are rare, and the conditions are semi-arid, the slopes being largely without trees, while great areas furnish rich natural pastures. The contrast is manifest in the distribution of the many small glaciers that cling about the higher peaks, the greater number of which are on the western side of the main divide. Of the larger streams which drain the eastern slope, only those having their sources near Glacier peak have the characteristic milky colour of glacial waters. The records of past glaciation also favour the view that the climatic differences between the two slopes are of great antiquity. The opposite flow of streams have extended their headwaters until the divide between them—a general north-to-south line—has become an irregular sharp-crested ridge, though the current idea that the mountains as a whole form a narrow, sharp-crested range is quite erroneous. The drainage system is extremely well developed, and the streams may be said to have reached the stage of maturity, their valley tracts extending far into the mountains, especially on the western side; the main reason for the greater amount of work performed by the western streams being that they discharge into an arm of the sea, while the eastern streams empty themselves into the Columbia at a considerable elevation above base-level of erosion. The Cascade mountains occupy a rugged tract from 100 to 125 miles wide, and throughout the belt of country from 50 to 70 miles broad rise to a general elevation of about 7,000 feet, while many peaks near the flanks of the range have approximately the same height. The district is, therefore, a deeply eroded tableland, the remnant of an ancient elongated dome, nearly flat-topped, but with probably a few secondary domes or protuberances on its surface and flanks. These consist principally of granite, while at least one ancient volcano helps to break the regularity of the original surface, raised to its level of some 7500 feet without pronounced tilt. It seems to have been what is technically known as a peneplain, due to strong erosion, no evidences pointing to a plain of marine denudation having been covered. Dr. Russell describes fully the dissection of the old plateau, the various geological formations represented, the extent of former glaciation, the phenomena of landslides, and other points for which reference must be made to the original paper.

Valleys of Solution in Arkansas.—In the first part of the *Journal of Geology* for the present year, Mr. A. H. Purdue calls attention to the striking examples of valleys of solution which occur in Northern Arkansas. Over a large area in this state the surface rock is the Boone chert—an immense deposit of limestone nearly 400 feet thick, containing a variable amount of chert. In this area the valleys referred to occur in great numbers, and are so different from the valleys of corrasion as to strike even the untrained observer. Narrow, as compared with their length, and always bi-laterally symmetrical, their slopes are straight and they rarely deviate from a straight line, except where two valleys unite.

heads, which are very abrupt, have often the appearance of half a sink-hole cut by a vertical plane. The bottoms and slopes are covered with angular residual chert and *débris* of trees, surface water never flowing except after excessive rainfalls. In their lower parts they pass into rather wide, open valleys which owe their forms both to solution and corrasion, the point of junction being determined, in the writer's opinion, by the ground-water level. After this has been reached a surface stream is found, which adds the work of corrasion to that of solution, the latter occurring mainly on the valley slopes above the stream-bed. As this work goes on the stream grows in size, and in time produces a wide valley. The valleys of solution seem to be determined by the jointing of the horizontal beds of rock, but the large valleys were probably inherited, with their streams, from the former superimposed rocks.

Surveys on the Alaskan Coast.—It is announced in a recent number of *Science* that two of the steamships of the U.S. Coast and Geodetic Survey will this summer survey some of the passages among the islands on the coast of Alaska, which, though of much importance for purposes of navigation, are still mapped largely on the basis of old Russian charts.

Lower California.—Dr. Gustav Eisen, whose earlier journeys in the cape region of Lower California were referred to in the *Journal* for 1896 (vol. viii. p. 398), has since 1897 devoted his attention to the more central parts of that little-known peninsula. In the fifth number of the *Bulletin* of the American Geographical Society for 1900, he sums up the results of his recent journeys as regards the geography of this central region, the conditions in which differ considerably from those in the north and south. As regards rainfall, the general rule is that Lower California enjoys summer rains on its gulf coast, while on the Pacific coast it receives principally the scanty winter rains. The former originate in the moisture brought from the Gulf of Mexico over the Mexican mainland and precipitated on reaching the high sierra which borders the eastern coast of the peninsula. Here the rain may be considered regular, though scant, while the western coast, which gets only the tail-end of the northern rains from Alaska, may not have any rain for three or four years at a time. The characteristic appearance of the whole peninsula is due to the torrential rainfalls, the country consisting of one mass of parallel arroyos or watercourses, most of which carry water only during and immediately after the rains. Springs and water-holes are generally situated in the beds of these watercourses, the former gushing out either from the bottom or sides of the cañon walls. A farm or village is usually met with close at hand, and in a few instances the springs are large enough to irrigate thousands of acres. The water-holes are generally placed in the trap-rock, and are often so hidden as to baffle search without the aid of a guide. The general aspect of the country is described as that of a vast elevated plain covered by a thick layer of trap-rock, above which, on the east, there rises the crest of a high granite sierra, the peaks reaching a height of 2000 to 3000 feet, and in isolated cases even 10,000 feet. The sloping, furrowed plains to the west are overtopped by thousands of isolated heights known as *mesas* and *picachos*, the former being flat lava-covered table mountains, the latter those which have, through wear, assumed a more pointed appearance. The granite peaks of the sierra form sharp, barren pinnacles of wild and irregular form. Though interesting to the botanist, the vegetation has little charm for the average traveller, the great basalt blanket being bare of trees. The promontory of the Santa Clara and Sierra Pintada is more volcanic, and the vegetation is better even where rain is scant. A low vigorous shrub called *torote* covers large areas, even forming a kind of low forest. Agriculture is in a backward state, owing to the lack of enterprise in the direction of irrigation, and the cultivated places are generally several days'

travel apart. The water-supply has apparently diminished of late years, possibly owing to the destruction of the irrigation ditches formerly maintained by forced Indian labour. With enterprise the productiveness of the country could be enormously increased, but, there being no means of communication, it would be difficult to dispose of the produce, and no advance is likely until some new impulse is given to the mining industries. The most important natural products are the orchilla and agave.

The Water-supply of Lake Nicaragua.—In two papers published in the *Bulletin* of the Geographical Society of Philadelphia for January last, Prof. Heilprin recurs to the question (*Journal*, vol. xv. p. 648) of the water-level of Lake Nicaragua, which he considers inconstant, and therefore detrimental to the success of any canal scheme relying on the lake-water as a source of supply. The point is an important one, but so far all that Prof. Heilprin has done has been to show the need for a thorough study of the subject, for the arguments on which his conclusions are based are far from convincing, owing to the frequent assumptions to which he is driven by the absence of sufficient statistical data. He endeavours to prove that the intake of the lake from the rainfall over its basin cannot be sufficient to counterbalance the loss from evaporation and the outflow by the San Juan. In the absence of a trustworthy series of observations on the actual level of the lake, he is thus forced to make somewhat venturesome assumptions both as to the annual rainfall over the basin, for which the principal data appear to be the observations at Rivas and one or two other stations, and as to the average loss by outflow. The possibility that certain mountainous districts within the watershed of the lake have a rainfall greatly in excess of any observed, does not seem to be considered at all. Prof. Heilprin is silent as to the real cause of the supposed fall of the lake-level, though he hints at geological causes which, it is to be presumed, would in his view have increased the rate of outflow, for he will not allow that any diminution of rainfall has taken place within recent years.

Survey of Bolivia.—We learn that an arrangement has been made by the Bolivian Government with Messrs. Hachette of Paris for the execution of a large-scale survey of portions of Bolivia in the departments of Oruro and La Paz. An area of 15,600 square miles is to be mapped on a scale of 1: 50,000, while certain mining and agricultural districts will be subject to a cadastral survey on the large scale of 1: 2000. Definite rules are laid down as regards the methods to be adopted, which will consist both of the establishment of a network of triangles with a mesh of from 15 to 30 kilometres (about 9 to 18 miles), and of the filling in of the topography by means of the Schrader tachograph, one point at least being fixed on the average in each square kilometre. The engineer in charge will be supported by three assistants.

AUSTRALASIA AND OCEANIC ISLANDS.

The Baldwin Spencer Expedition to North Australia.—Messrs. Baldwin Spencer and Gillen left Adelaide on March 15 for their new expedition for the study of the aborigines of the northern interior of Australia. The existence of drought in the interior, which somewhat delayed the start, may necessitate a change in the original plan, according to which the explorers were to have crossed the McDonnell range and then proceeded north towards the Daly or Victoria rivers. Instead of this, it is possible that a renewed start may be made southward from the north coast.

Marine Fossiliferous Rocks at Kerguelen.—Prof. Ralph Tate, in a paper recently read before the Royal Society of South Australia, calls attention to the important discovery of marine fossiliferous rocks at Kerguelen island, made by

Mr. Robert Hall of Melbourne during his visit to the island in 1898. According to Mr. Hall's field-notes and sketches, this fossil development occupies a depression on the west side of the peak known as Cat's Ears, and attains an elevation of 826 feet. The rock is described as a fine-grained friable sandstone of a grey colour, dappled with rust-coloured grains, and is richly prolific in fossils. Only fourteen species are, however, represented, the *Chiones* and *Turritella* being the only ones occurring abundantly. The fauna is probably Tertiary, the species, so far as defined, being quite distinct from those now existing in the fauna of Kerguelen island and other similar southern positions.

POLAR REGIONS.

Light and Vegetation in the Arctic.—Prof. J. Wiesner, of Vienna University, who for some years has been engaged in researches on the requirements of plants in the matter of light, has come to the following conclusions with regard to the plants of the arctic regions. The demonstration previously put forward by him with regard to low and middle latitudes, that with the increase of latitude the light-requirement of plants also rises, has been shown, by observations made in Norway and at Advent bay, Spitsbergen ($78^{\circ} 12' N.$), to apply equally to sub-arctic and arctic regions. The reasons for this marked need of light are the low temperatures which prevail at the vegetative period, the want of heat being made up for by excess of light, the amount of which must therefore increase with the decrease of temperature. It thus comes about that a limit is set to the migration towards the pole of bush and tree vegetation, less by the cold of winter than by the constantly increasing need of light, which can of course be less and less satisfied. As a rule, the plants of the far north can stand but a small diminution of their quantum of light, such as is caused by the interception of the sun's rays through the configuration of the country. Dr. Peucker's researches on mountain-shadow (*Verhandlungen des Deutschen Geographentages*, 1897) have shown how the amount of light required can be laid down with precision in each particular case. The intensity of the direct sunlight to which arctic plants are exposed is very slight, for it only becomes perceptible when the sun reaches an altitude of 15° above the horizon, whereas in the most favourable case (on June 21) the sun only attains, at Advent bay, an altitude of 30° to 35° . Direct sunlight here at best reaches the strength of the light radiated from the whole expanse of the sky (the so-called "diffused light"), so that the whole illumination available for polar plants is at most double the amount of the diffused light. The high-alpine plants of mean latitudes, on the contrary, enjoy an amount of illumination which may be estimated at a maximum of at least four times that due to the diffused light, the sun reaching a midday altitude in summer of 66° to 69° . These differences result, as Bonnier has shown, in considerable variations in the organs of plants of like species, which occur both in high-alpine and high-arctic regions. In middle latitudes the effect of aspect on vegetation is very striking, the northern slopes of mountains being often bare of plants. But in view of the much nearer approach to a complete circuit round the horizon made by the sun in arctic latitudes it is easily seen that this influence is less felt there than anywhere. Of much interest, lastly, is the demonstration of the influence exercised by differential lighting on the form of trees, the low angle at which light is received especially favouring the pyramidal shape in arctic latitudes, though this is by no means detrimental under the more nearly vertical lighting of low latitudes. The cypresses of the south are, in fact, protected by their form from the injurious effects of a vertical sun, while the same form enables the firs, pines, and white poplars of Norway and Sweden to make the most of the horizontal rays of the northern sun.

GENERAL.

Honour for Mr. Seton-Karr.—Mr. H. W. Seton-Karr has received the Galileo Medal for scientific merit from the Faculty of the R. Istituto di Studi Superiori of Florence, for his explorations in connection with prehistoric stone implements in Egypt and East Africa.

Death of Dr. Konrad Natterer.—On February 15 last, Dr. Konrad Natterer died at Vienna, after a short illness, in his 41st year. Dr. Natterer was Professor of Chemistry at Vienna University, and was well known to geographers for the part which he took, as chemist, in the Austrian Expedition, in the *Pola*, to the Eastern Mediterranean, the Ægean and the Red sea, and also in that in the *Taurus* to the Sea of Marmora.

OBITUARY.

The Rev. James Chalmers.

A MELANCHOLY and most regrettable catastrophe has recently been reported from British New Guinea. The Rev. James Chalmers, who for twenty-three years had laboured among the natives of that island as an emissary of the London Missionary Society, and whose name is indissolubly connected with the history of the first opening of its dark recesses to civilizing influences, has, with one European coadjutor and twelve native students, been murdered by the natives on the Aird river, while endeavouring, according to one account, to stop a fight which was in progress among the turbulent natives of that little-known part of British New Guinea.

Mr. Chalmers was an exceptional man, whose loss it will be most difficult to supply. By his force of character, untiring energy, and great influence with the natives, he had done more than any one man to bring about improved conditions of life among the once wild and dangerous tribes inhabiting the coast regions of the south-east of the island, some of whom, thanks to the labours of himself and his associates, have made a decided advance in the scale of civilization. He had succeeded in gaining their affection and confidence in a surprising degree, and that he has met his death at the hands of natives is explained by the fact that the Aird river district is an outlying tract rarely visited by white men, to which, therefore, his reputation as a friend of the native race had had little opportunity of penetrating.

To geographers Chalmers was well known for his many enterprising journeys, to which, before the declaration of the British protectorate, they were principally indebted for a knowledge of any part of the island away from the most frequented portions of the coast. In 1878 the whole south-eastern coast was explored in the mission steamer *Ellangowan*, but the first extensive journey of exploration inland was made in 1879, when the interior behind Port Moresby, in the basin of the Laloki or Goldie river, was examined with a view to finding more healthy and suitable localities than exist on the coast for the prosecution of missionary work. In the following year he turned his attention, with a similar object, to the Kabati district, behind Redscar bay, and in 1883 he made an important journey to the western coast districts of the British territory, the same in which he ultimately met his death. A result of this journey was to call attention to the mouths of an important river system east of the Fly, though it was reserved for others to throw light on the actual features of this system. In 1887, while on a visit to this country, he read a paper before the Society summarizing the results of all his journeys up

to that date, which were also described in more detail in two works entitled 'Work and Adventure in New Guinea' (1885) and 'Pioneering in New Guinea' (1887). Few equalled Chalmers in their knowledge of the manners and customs of the New Guinea tribes, on which he occasionally published papers in various scientific journals. Ethnological collections of considerable value were also made by him, and some of these have, it is satisfactory to know, found their way to the British Museum. Science is likewise indebted to him for the valuable aid cordially rendered to travellers and investigators who visited his sphere of action.

CORRESPONDENCE.

Magnetic and Meteorological Observations in the Antarctic.

THE diagrams you published in the *Journal* for December last, which proved that the auroral displays in the antarctic regions were synchronous to the day with those of arctic stations, have brought me into an interesting correspondence with Mr. Arctowski, of the *Belgica*. That gentleman reproduced the curves in *Ciel et Terre*, and said that, as I had at my command more *data* respecting northern auroræ than he possessed, it was my duty to pursue the subject, and ascertain if the opinion was really final, expressed in the *Journal*—that only general concordance could be expected. If, he said, we were to take positions homologous with respect to the northern and southern magnetic poles respectively, would there not be concomitances in the particular character of the auroræ which were at the same time visible? To enable this comparison to be made, he sent me his paper on the "Aurore Australe Mouvementée" of September 2, 1898, with sketches illustrating the letterpress (*Ciel et Terre*, January 1, 1901).

I at once inquired if there were any records in the excellent magnetic and meteorological observatory here which gave details of the times of the most brilliant flashes of the aurora borealis of that date, of the height and azimuth of the auroral arc, of the colours observed, etc. Mr. R. P. Stupart, the director, has set on foot inquiries, and so have I, through the public journals of our northern country. We may find some facts of interest, but the North-West Territories and Hudson Bay posts which are in an approximately homologous position are far away, and it will take some weeks to find out if there are any records accurately kept. I also asked Prof. F. H. Bigelow, of the United States Weather Bureau, to favour me by examining the Washington records, and I have received, through the courtesy of Mr. Willis M. Moore, the chief of that Bureau, a record of auroral observations at eight stations, viz. Rochester, New York; Sault Ste. Marie and Grand Haven, Michigan; Green Bay and Milwaukee, Wisconsin; Dubuque, Iowa; Duluth and Minneapolis, Minnesota. I am sending copies to Mr. Arctowski direct, as also eight observations of the aurora of September 9-12, 1898, for comparison by himself. I will only say here that the differences between the features of the auroræ are so great that if they prove anything, they prove such a diversity that it would be unreasonable to look for concordances between the particular details of the auroræ so well observed by Mr. Arctowski on the *Belgica* and the auroræ seen here, which do not even agree among themselves. For instance, Milwaukee and Sault Ste. Marie are in longitudes which only differ by three degrees, which is also their difference in latitude. At Milwaukee "the aurora lasted from 8.15 until after midnight, colours green and yellow, and yellowish-green upon blending of the two primary colours; at times a red tinge was shown in the rapid scintillations and oscillations from west to east and from east to west."

There was a constant shooting of the streamers toward the zenith, the whole appearing to be coloured with a silvery sheen, and extending from slightly west of north-west to slightly east of north-east, and reaching from the horizon toward the zenith to about 45° ." At Sault Ste Marie "the aurora was visible at intervals from 9.15 to 10.45. At 10.15 an arch formed with an azimuth of about 80° , reaching to a height of 35° , and with streamers which reached to the zenith. No colours noticed."

It may be said that these stations are not in a homologous position with respect to the magnetic pole to that occupied by the *Belgica*. But I do not know how, at present, one can strictly define homologous positions. Terrestrial latitudes and longitudes do not afford a guide; magnetic meridians and parallels (if I may use the words) have yet to be mapped out for the antarctic and much of the arctic territory. But, as Prof. Bigelow writes, the subject is very fascinating. He thinks the simultaneous excitement of aurora at both poles, which Mr. Arctowski's observations have enabled me to demonstrate, indicates that the Earth is within an external magnetic field; so you see even astronomy and solar physics are concerned in the matter.

I write to you that you may urge on the several antarctic expeditions, soon to start, the duty of collecting just such careful records of the features of each aurora seen as Mr. Arctowski has done, and we in Canada and our friends in the United States will take special note of all we observe, so that Mr. Arctowski shall have plenty of material to work upon and add to the obligation students of auroral phenomena acknowledge they owe him. Even if he proves a negative, i.e. that there is not a particular concordance in auroral features north and south, it will be a conclusion not without its value. It will not destroy the importance of what has been proved, the concordance, to the day, of great auroræ in both hemispheres, with all that this implies.

I am induced by similar considerations to ask the attention of the meteorological observers going to the antarctic to a theory of atmospheric circulation, which, if it be not new, it is because in a colonial city one misses something of recent science.

The Solar Institute of Montevideo, Uruguay, of which the writer is an honorary president, called upon me, through Mr. C. Honoré, its director, to make temperature observations during the eclipse of the sun, in May, 1900, which was almost total here—enough to make the dandelions close. I did so, every minute, and would send you the resulting curve if it differed from those taken elsewhere. The dip was over 10° Fahr., and the lowest point was a minute or two after the central time of the eclipse. I was informed by Mr. Stupart that his (shaded) thermometers also marked a considerable dip, and that there was a slight depression of the barometers, especially noticeable on the record of the aero-barograph, a very sensitive water-barometer, perfected by Mr. Napier Denison, now of Victoria, B.C. I gave this no thought at the time, but when Mr. G. E. Lumsden, now president of our Astronomical Society, returned from the south, where he went to see the phenomena of a total eclipse, he spoke of the "eclipse wind." Just before the first contact, there came a breeze, and the astronomers hurried to put up some shelter-canvas, but the wind died away, and at centrality there was a complete calm.

It did not take long, having these three elements, to see that as the shadow of the moon swept across the continent, the air within the conical frustum was chilled. That made it denser, especially near the Earth's surface, and it contracted, leaving a depression in the upper air. The dense cold air near the surface first had to recover from the effect of contraction, and then flowed outwards faster than the void due to contraction filled, hence a condition and an effect like those attending

other cases of barometric "lows." It is, however, the cooling of the air which concerns the present argument. That is undeniable, and it seems equally clear that this cooled air must flow from the bottom of the funnel outwards. There would be a high barometer if the shadow were stationary for an hour, but it moves over a couple of thousand miles in that time, wherefore the effects are transient and localized. Our barograms do not show a rise before or after the passing of the shadow above the average of the general trend, but only a recovery of pressure. There ought, however, it seems, to be a rise following the eclipse, a sort of atmospheric tidal wave of small dimensions.

But if, instead of a rapidly passing shadow, only small in size, you have a dark region of a thousand miles or more across, remaining dark for months, what a contraction of the air you must have, what a tremendous outflow of cold air there must be from all the lower parts of this dark area, what an inrush above to fill up the depression! Such, I conceive, is necessarily the condition near either pole during its winter season. The change from the heat of the long summer to the cold of the long dark winter is very great, far greater than the difference between summer and winter between the tropics. It is this polar alternation of heat and cold which sets our atmosphere in motion, and *at the poles, not at the equator, we must begin our studies of meteorology.* The four or five months' day in Antarctica comes to an end, and the long depressing night Arctowski so well describes sets in. The air becomes frigid and contracts, the outflow from the pole upon the surface is more than made up by the inrush from the north of the upper air; hence, probably, a high barometer, which will be constant, and tend to make the southerly surface winds constant too. This condition must prevail over a more extensive area at the end of June than at other times; but, as in the case of the eclipse, the lowest temperature lags behind the central darkness, and occurs in July. Afterwards, as the continuously dark area contracts, and the limit of out-rushing southerly cold winds retreats, the long antarctic days set in, when all conditions are reversed, and the north polar region in its turn takes up the rôle of a condenser.

I cannot quite reconcile Mr. Arctowski's wind-roses to this theory, which, it seems, must be true. But local conditions much affect surface wind-currents, and the configuration of Belgica straits may have a disturbing influence which interferes with the results of calculation. If a correct theory, it becomes a question how far from the south pole these winds extend without causing counter-currents and low barometers. The subject can be better examined at the south than at the north, because the great area of land in Siberia introduces such disturbing elements.

ARTHUR HARVEY.

80, Crescent Road, Toronto, Canada, March 18, 1901.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Tenth Ordinary Meeting, April 29, 1901.—Sir CLEMENTS MARKHAM,
K.C.B., President, in the Chair.

ELECTIONS.—*R. N. Ghose; Daniel Maria Freire Corte-Real; William Cutlack; Ronald Audley Martineau Dixon; Lieut. Henry Joseph Dresser, 1st Royal Warwickshire Regiment; Rev. Mark Christian Hayford; Rev. Cuthbert Kearton, O.S.; Lieut. Joseph King, R.N.R.; Captain Hesperus David Watkiss Lloyd, Scottish*

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Rifles; Captain H. G. Lyons; John Smith Pilbron; Frederic Shelford, B.Sc.; Basil H. Soulsby; Francisco Uriburu.

The Paper read was:—

“Travels in Central Kurdistan.” By Major F. R. Maunsell, B.A.

The PRESIDENT said: I have great pleasure in being able to announce to the meeting that His Majesty, King Edward VII., has been pleased to accept the office of Patron of this Society. I may mention that the King is now the oldest official of this Society, having belonged to it continuously, and having held office since the year 1862. I may also mention that His Majesty has been pleased to inform us that he will continue the grant of £50 a year for the promotion of geographical research, which was given by our founder, King William IV., and by her late Majesty every year.

The Patron's medal has been awarded by the Council to-day to His Royal Highness the Duke of the Abruzzi, for his work in Franz Josef Land; and the Founder's medal has been awarded to Dr. Donaldson Smith, for his important discoveries in Africa.

I am sorry that I had not the opportunity before, owing to my illness, of thanking very heartily, on the part of this Society, the Argentine Government for its liberality and for the interest it takes in geographical research in having granted a very handsome sum of money for the establishment of a magnetic observatory on Staten island for purposes connected with the Antarctic Expedition. We have specially to thank His Excellency the Minister for Foreign Affairs of Buenos Aires, and His Excellency Snr. Dominguez, the minister in London, and, above all, our friend Sr. Dr. Francisco Moreno, whom we all know, for having obtained this important concession for us from the Argentine Government. Our relations with the geographers of that Republic have always been most friendly and cordial since the time when Captain Page and his son read their papers here, and since that we have received important communications from Don Ramon Lista, and especially from Dr. Francisco Moreno quite recently. The Argentine people have always shown very great interest in the science of geography, and anxiety to work in concert with European countries for scientific aims, and especially with this country and with our Society. I am sure you will wish me to express my thanks through Señor Dominguez to the Argentine Government.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian, R.G.S.*

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
O. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.

Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selakah.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Dalmatia. *Abregé B.S. Hongroise G.* 27 (1899): 38-54. **Czink.**

Pago. Isola dalmata. By Lodovico Czink. [From *Földrajzi Közlemények*, 27 (1899): 301-319. *With Illustrations.*]

Austria-Hungary. *Deutsch. Rundschau G.* 23 (1901): 321-323. ———

Ergebnisse der Volkszählung in Oesterreich-Ungarn.

Austria—Meteorology. ———

Jahrbücher der k.k. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1898, N.F. xxxv. Band (pp. xxii. and 146); Jahrgang 1899, N.F. xxxvi. Band, I. Theil. Wien, 1900. Size 12 × 9½, pp. 120, 32, 24, and 16. *Presented by the Institution.*

Austria and Germany. *Globus* 79 (1901): 165-171, 183-188. **Ruge.**

Rattenberger Studien. Zur Volkskunde aus dem unteren Innthal in Tirol und aus Oberbaiern. Von Sophus Ruge. *With Illustrations.*

Treats, among other subjects, of the distribution of the villages, the place and family names, of parts of the Tirol and Bavaria.

France—Ardennes. *Ann. G.* 10 (1901): 123-139. **Léon.**

Une excursion géographique dans l'Ardenne. Par Paul Léon. *With Plates.*

France—Bassigny. *Ann. G.* 10 (1901): 115-122. **Gallois.**

Le Bassigny. Par L. Gallois.

A study of the application of the name Bassigny, with a view to elucidating the question of the nomenclature of "pays," or natural divisions of a country.

France—Dunes. *Deutsch. G. Blätter* 24 (1901): 15-25. **Le Mang.**

Die Dünen der französischen Nordküste. Von Dr. Richard Le Mang.

France—Havre. **Hertalet.**

Trade of Havre Consular District for the year 1900. Foreign Office, Annual No. 2562, 1901. Size 10 × 6½, pp. 50. *Price* 3d.

Though the total tonnage entering Havre during 1900 showed a decrease, British shipping showed a considerable increase, owing to the great demand for coal. It reached 974,833 tons out of a total of 2,429,242.

France—Hérault. *B.S. Languedoc. G.* 23 (1900): 1-14. **Rouville.**

Quelques aperçus de Géologie communale. Par M. de Rouville.

Extracted from a work on the communes of the department of Hérault, by M. Fabre.

France—La Camargue. *Le Globe, B.S.G. Genève* 12 (1900-1901): 44-47. **Chodat.**

La Camargue. Par M. le prof. R. Chodat.

Abstract of a paper in which special attention is paid to the influence of soil on vegetation in the region of the Rhone delta.

France—Prehistoric Man. *B.S.G. Com. Bordeaux* 27 (1901): 77-84, 97-105. **Descoffre.**

La Charente préhistorique; station humaine quaternaire d'Haute-Roche. Par M. P. Descoffre. *With Illustrations.*

France—Rhône. *B.S.G. Com. Bordeaux* 27 (1901): 89-96. **Sauvaire-Jourdan.**

Les canaux du Rhône. Par M. le Prof. F. Sauvaire-Jourdan.

France—Tarn. *B.S. Languedoc. G.* 23 (1900): 52-59. **Rouville.**

Le Sidobre. Par P. G. de Rouville. *With Illustrations.*

The Sidobre is an arid plateau, strewn with blocks of granite and deeply furrowed by ravines.

Germany—Seiches. *Sitzb. A. W. München* (1900): 435-462. **Ebert.**

Periodische Seespiegelschwankungen (Seiches), beobachtet am Starnberger See. Von H. Ebert.

On the results of observations carried out in 1900.

- Historical.** *Földrajzi Közlemények* 27 (1899): 205-210. **Hervéth**
 Plinius ismeretei a szittyák hazájáról és Európa északi részeiről. Horváth Zoltántól.
 On the knowledge possessed by Pliny respecting Scythia and Northern Europe.
- Hungary.** *Abrégé B.S. Hongroise G.* 27 (1899): 15-19. **Czirbus**
 Die Entsumpfung des Ecseder Moores. Von Dr. Géza Czirbusz. [From *Földrajzi Közlemények* 27 (1899): 97-122.] *With Map.*
- Switzerland.** **Milligan**
 British Trade with Switzerland for the year 1899. Foreign Office, Miscellaneous, No. 542, 1900. Size 10 x 6½, pp. 48. Price 2½d.
- Switzerland.**

 Annuaire statistique de la Suisse, Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur, Neuvième Année, 1900. Bern: Stämpfli & Cie, 1900. Size 10 x 6½, pp. 314.
- Turkey.** *Deutsche Rundschau G.* 23 (1901): 165-169. **Braun**
 Heide und Scrub in propontischen Gebieten. Von Fritz Braun. *With Illustrations.*
 On the surface features of the country bordering the sea of Marmora.
- United Kingdom—Cornwall.** **Colenso**
T. and P. New Zealand I., 1899, 32 (1900): 309-324.
 Memorabilia, Ancient and Modern; being Remarks and Information respecting some of the Tin-mines in Cornwall, England. A Fragment left by the late W. Colenso.
- United Kingdom—East Anglia.** **Dutt**
 Highways and Byways in East Anglia. By William A. Dutt. London: Macmillan and Co., 1901. Size 8 x 5½, pp. xvi. and 412. *Map and Illustrations.* Price 6s. *Presented by the Publishers.*
 A most interesting account of the Eastern Counties and their historical associations, with abundant details on their towns, churches, castles, etc., as well as on the natural features of the country districts. The tasteful drawings of Mr. Pennell add much to the attractiveness of the book.
- United Kingdom—England.** *Quarry* 6 (1901): 78-86.

 Pennant Stone. *With Illustrations.*
 Account of the Pennant stone quarries near Bristol.
- United Kingdom—London.** *J. School G.* 5 (1901): 41-51. **Davies**
 The Geography of Greater London. By A. M. Davies. *With Map.*
 Mainly a description of the Thames valley near London.
- United Kingdom—Scotland.** *Brit. Assoc. Rep.* (1900): 46-52. **Buchan**
 Meteorological Observations on Ben Nevis. Report of the Committee. (Drawn up by Dr. Buchan.)
- United Kingdom—Scotland.** *J. Anthropol.* 1. 30 (1900): 56-73. **Lewis**
 The Stone Circles of Scotland. By A. L. Lewis. *With Plans and Illustrations.*
- United Kingdom—Yorkshire.** *Brit. Assoc. Rep.* (1900): 346-349. **Dwerryhouse**
 The Movements of Underground Waters of Craven.—First Report of the Committee. (Drawn up by the Secretary, Mr. A. R. Dwerryhouse.)
- United Kingdom—Yorkshire.** **Howarth and Others**
P. Yorkshire Geolog. and Polytechnic S. 14 (1900): 1-44.
 The Underground Waters of North-West Yorkshire. Part i. The Sources of the River Aire. [Papers by J. H. Howarth, C. W. Fennel, J. A. Bean, F. W. Branson, W. Ackroyd, P. F. Kendall, and W. Lower Carter.] *With Diagrams and Illustrations.*

ASIA.

- Central Asia.** **Deasy**
 In Tibet and Chinese Turkestan, being the Record of Three Years' Exploration. By Captain H. H. P. Deasy. London: T. Fisher Unwin, 1901. Size 9 x 6, pp. xvi. and 420. *Map, Portrait, and Illustrations.* Price 21s. net. *Two Copies, one presented by the Author, the other by the Publisher.*
 This will be noticed with other Asiatic books.

- Central Asia.** *J. Manchester G.S.* 16 (1900): 197-201. **Deasy.**
The Roof of the World: Journeys in Central Asia. By Captain H. H. P. Deasy.
- Central Asia.** *Globus* 79 (1901): 188-194. **Friederichsen.**
Professor Futterer's Reise durch Asien. Von Dr. Max Friederichsen.
A review of Dr. Futterer's book.
- China.** *Rev. Française* 26 (1901): 197-205. **Barré.**
Chine: Les provinces voisines du Tonkin. Par P. Barré.
- China.** *Fortnightly Rev.* 68 (1900): 713-739; 69 (1901): 193-206, 278-393. **Hart.**
The Peking Legations: a National Uprising and International Episode. *With Plans.*—China and Reconstruction. November, 1900.—China and Non-China. By Sir Robert Hart.
- China.** **Little.**
Mount Omi and Beyond. A Record of Travel on the Thibetan Border. By Archibald John Little. London: W. Heinemann, 1901. Size 9 × 6, pp. xiv. and 272. *Map and Illustrations.* Price 10s. net.
A special notice of this book will be given.
- China.** *Questions Dipl. et Colon.* 11 (1901): 268-283. **Zimmermann.**
La pénétration de la Chine méridionale. Par M. Zimmermann.
The writer urges the importance to France of the construction of a railway to Yunnan.
- China—Hoang-Ho.** *Mouvement G.* 18 (1901): 112-114.

La navigabilité du fleuve Jaune (Hoang-ho). *With Map.*
- China—Hong Kong.** **Blake.**
Hong Kong. Report for 1899. Colonial Reports, Annual No. 314, 1901. Size 9½ × 6, pp. 44. Price 2½d.
Among the industries of the colony (including the new territory) are the manufacture of sugar, rope, cement, paper, preserved ginger, salt, etc., as well as ship and boat building. The vessels constructed in 1899 numbered 116, with an aggregate tonnage of 5965½ tons. The shipping (entered and cleared) reached a total of 18,101,309 tons, an increase of 835,529 tons as compared with 1898, 48 per cent. being British.
- China—Kansu.** *Mouvement G.* 18 (1901): 149-151. **Bonin.**
Les mines d'or du Kansu occidental. Par Charles-Eudes Bonin.
- China—Native Commerce.** *B.S.G. Com. Havre* 17 (1900): 133-157. **Hauchecorne.**
La Classe marchande et le Commerce indigène en Chine. Par M. A. Hauchecorne.
- China—Pechili.** *Mouvement G.* 18 (1901): 61-62.

Le Petchili. *With Map.*
- China—Yang-tse-kiang.** *Rev. G.* 48 (1901): 170-180. **Bonin.**
La navigabilité du fleuve Bleu. Par Charles Eudes Bonin.
- China—Yang-tse-kiang.** *B.S. d'Études Colon.* 8 (1901): 186-196. **[Ebbecke.]**
La Navigation à vapeur dans les Rapides du Yang-tse-Kiang.
On a voyage through the Yang-tse gorges, carried out in June, 1900, by the *Pioneer*, one of the vessels of the Yang-tse Trading Company.
- China—Yunnan.** *B.S.G. Com. Havre* 17 (1900): 181-188. **Leclère.**
Exploration au Yun-Nan de M. A. Leclère.
Account of the mission carried out in 1898-99 for the examination of the mineral resources of South-West China.
- China and Central Asia.** *La G., B.S.G. Paris* 3 (1901): 115-122, 169-180. **Bonin.**
Voyage de Pékin au Turkestan russe par la Mongolie, le Koukou-nor, le Lob-nor et la Dzoungarie. Par M. Charles-Eudes Bonin. *With Map.*
A note on this paper is given in the Monthly Record for May (p. 526).
- Korea.**

Description of Korea. Compiled at the Office of the Minister of Finance. [In Russian.] 3 vols. St. Petersburg, 1900. Size 11 × 7½, pp. (vol. i.) xvi. and 448; (vol. ii.) vi. and 490; (vol. iii.) vi. and 318. *Map and Plate.* Presented by the Russian Ministry of Finance.
The map—in Russian character—is on the scale of 1 : 1,355,000.

- Malay Archipelago.** Horst
Tijds. K. Ned. Aard. Genoots. Amsterdam 18 (1901): 92-93.
 Reis naar de Banggai- en Soela-eilanden. Door Dr. D. W. Horst.
 On a visit in 1899 to the island groups east of Celebes.
- Malay Archipelago—Celebes.** *Ann. Hydrographie* 29 (1901): 49-67. —
 Zur Küstenkunde von Celebes.
- Malay Archipelago—Moluccas.** *Ann. Hydrographie* 29 (1901): 67-75. —
 Zur Küstenkunde des Molukken-Archipels.
- Malay States—Forests.** Hill
 Report on the present system of Forest Administration in the Federated Malay States, with suggestions for the future management of the Forests of those States. By H. C. Hill. (Supplement to the *Perak Government Gazette*, October 26, 1900.) Pp. vi. and 25.
- Pamirs—Shugnan.** *J. United Service I. India* 29 (1900): 385-404. Serebrennikof
 Reconnaissance of Shugnan in 1894. By A. Serebrennikof. Translated from the Russian by Major E. J. Medley.
 Another version of the paper published in the *Journal* for December last.
- Philippine Islands.** *National G. Mag.* 12 (1901): 114-119. —
 Geographic Facts from Report of the Taft Philippine Commission.
- Russia—Caucasus.** *Die Natur* 49 (1900): 613-615. Rossmässler
 Die Halbinsel Apscheron. Von F. A. Rossmässler.
- Russia—Siberia.** *Izvestiya Russ. G.S.* 36 (1900): 433-451. Ignatov
 The Teniz-Kurgaljinsk Lake-basins in the Akmolinsk District. By P. Ignatov. [In Russian.] *With Map*.
- Russia—Siberia.** Patkanov
 Die Irtysh-Ostjaken und ihre volkspoesie. Von S. Patkanov. II. Teil. Ostjakische Texte mit Deutscher und Russischer Uebersetzung nebst Erläuterungen. St. Petersburg, 1900. Size 12 × 8½, pp. viii., xii., 26, 302, and 114. *Map and Plates. Presented by the Imperial Academy of Sciences of St. Petersburg.*
 This completes the work commenced in 1897 (cf. *Journal*, vol. xii. p. 207).
- Russia—Siberia.** Stadling
 Through Siberia. By J. Stadling. Edited by F. H. H. Guillemard, M.A., M.D. London: A. Constable & Co., 1901. Size 10 × 6½, pp. xvi. and 316. *Maps and Illustrations. Price 18s. Presented by the Publishers.*
 The author here gives an account of the journey undertaken by him in 1898 for the purpose of making inquiry among the tribes of Northern Siberia in reference to the fate of Andrée and his companions. Mr. Stadling traversed some of the least-known districts between the Lena and the Yenesei, and the information he gives is of great interest, with respect to both the geography and the social and political condition of the regions visited.
- Russia—Siberia.** Stromberg
A travers le Monde, Tour du Monde 7 (1901): 49-52, 57-60.
 L'Émigration en Sibérie sous les auspices du gouvernement. Par Marie Stromberg. *With Illustrations.*
- Russia—Transcaucasia.** *Rev. G.* 48 (1901): 19-22. Khakhanoff
 La Géorgie à l'Exposition universelle de Paris (1900). De la fondation d'une chaire de géorgien à l'Ecole des langues orientales vivantes, proposée par M. Isarloff. Par Prof. A. Khakhanoff.
- Russia and China.** *Izvestiya Russ. G.S.* 36 (1900): 379-432. Ilinski and Bretschneider
 The new Russo-Chinese Frontier and the islands acquired by Russia in the Korea-Liao-tung Gulf. By S. Ilinski. With remarks by E. Bretschneider. [In Russian.] *With Map*.
- Siam—Malay Provinces.** *Brit. Assoc. Rep.* (1900): 393-398. Skeat
 Report on Cambridge Exploring Expedition to the Malay Provinces of Lower Siam. Drawn up by W. W. Skeat.
- Siam—Trade.** *Oester. Monats. Orient.* 27 (1901): 14-20. Genta
 Der Handel von Siam. (Bericht für das Jahr 1899 von Hermann Genta.)

- Turkey—Armenia.** *Ymer* 20 (1900): 347–375. **Johansson.**
 Om de nyaste upptäckterna i Armenien. Af K. F. Johansson.
 On recent archæological discoveries in Armenia.
- Turkey—Babylonia.** **Streck.**
 Die alte landschaft Babylonien nach den Arabischen Geographen. Von Dr. Maximilian Streck. I. Teil. Leiden: E. J. Brill, 1900. Size $9\frac{1}{2} \times 6$, pp. xvi. and 172. *Price* 5s.
 The first instalment of a careful study of the ancient geography of Babylonia, as known from the Arabian writers.
- Turkey—Palestine.** *Palestine Exploration Fund, Q. Statement* (1901): 44–49. **Cady.**
 Exploration of the Wâdy Môjib from the Dead Sea. By the Rev. Putnam Cady.
With Illustrations.
 Note on Same. By Major-General Sir Charles Wilson, K.O.B.
- Turkey—Palestine.** *M.G. Ges. Wien* 43 (1900): 335–380. **Kubitschek.**
 Die Mosaikkarte Palästinas. Von Prof. Wilhelm Kubitschek. *With Illustrations.*
 On the ancient Mosaic map recently discovered at Madaba (cf. *ante*, p. 516).
- Turkey—Palestine—Dead Sea.** **Gautier.**
 Lucien Gautier. Autour de la mer Morte. Genève: Ch. Eggimann & Cie., 1901.
 Size $9\frac{1}{2} \times 6$, pp. 138. *Map and Illustrations.* *Price* 3s.
 An interesting account of the neighbourhood of the Dead Sea and its antiquities, from personal observation.
- Turkey—Syria.** **Cuinet.**
 Syrie, Liban et Palestine. Géographie administrative, statistique, descriptive et raisonnée. Par Vital Cuinet. Fasc. 4 et Index. Paris: E. Leroux, 1901. Size $11 \times 7\frac{1}{2}$, pp. 461–694. *Map.* *Price* [entire work], 20 fr.
 A useful geographical and statistical description of Syria and Palestine, by the well-known author of 'La Turquie d'Asie.'

AFRICA.

- Africa.** **Pitman.**
 Pitman's New Era Geography Reader. Africa. London: Sir Isaac Pitman & Sons [not dated]. Size $7\frac{1}{2} \times 5$, pp. 220 and xx. *Maps and Illustrations.* *Price* 1s. 6d.
Presented by the Publishers.
 This reader is the work of six authors, each supposed to possess special knowledge of a particular part of Africa. While this plan may have some advantages, it results too often in inaccurate generalization and the absence of a broad grasp of the outlines of African geography. Among the more serious mistakes are, the statement that the inhabitants of Darfur are Fulahs; that the Krumen are not natives of West Africa, but only settlers; that the Nasamonian explorers were Greeks; that Wadai is partly within the British sphere; and that along the whole coast of West Africa, from Cape Blanco to Cape Frio, the year is divided into two seasons, a wet and a dry, each of six months' duration.
- Africa.** *Rev. Française* 26 (1901): 158–163. **Vasco.**
 L'Afrique en 1800 et en 1900. Par M. G. Vasco. *With Maps.*
- Africa—Railways.** *G.Z.* 7 (1901): 65–77. **Kürchhoff.**
 Die Eisenbahnen in Afrika und ihre Bedeutung für den Handel. Von Oberleutnant a. D. Kürchhoff. *With Map.*
 A useful summary of recent railway development in Africa. The map shows, without distinction, lines open and under construction, omitting other projected lines. The extension of the Ain-Sefra line to Jenien-bu-Rezg is not shown.
- Africa—Rubber production.** *Deutsch. G. Blätter* 24 (1901): 9–15. **Friedrich.**
 Die Kautschukproduktion Afrikas. Von Dr. E. Friedrich. *With Map.*
- British Central Africa.** *Scottish G. Mag.* 17 (1901): 129–148. **Sharpe.**
 Trade and Colonisation in British Central Africa. By Alfred Sharpe, C.B. *With Illustrations.*
- British East Africa.**
 Précis of Information concerning the British East Africa Protectorate and Zanzibar. Revised in the Intelligence Division, War Office, December, 1900. London: Eyre

& Spottiswoode, 1901. Size $9\frac{1}{2} \times 6$, pp. 134. *Maps. Price 3s. Presented by the Intelligence Division, War Office.*

British East Africa. *J. Manchester G.S.* 16 (1900): 178-196. Ainsworth

A Description of the Ukamba Province, East Africa Protectorate, and its Progress under British Administration. By John Ainsworth, c.m.g. *With Illustrations.*

British East Africa—Uganda. Bindloss

Imp. and Asiatic Quarterly Rev. 11 (1901): 294-302.

The Present State and Future Prospects of Uganda. By H. Bindloss.

Canary Islands—Dust Haze. Scott

Note of a remarkable Dust Haze experienced at Teneriffe, Canary Islands, February, 1898. By Robert H. Scott, D.Sc., F.R.S. (From the *Quarterly Journal of the Royal Meteorological Society*, vol. xxvi. No. 113, January, 1900.) Size $10 \times 6\frac{1}{2}$, pp. 33-36.

Central Africa. Moore and Fergusson

Tanganyika and the Countries North of it. By J. E. S. Moore. *Methods used in Surveying, and General Notes.* By M. Fergusson. (From the *Geographical Journal* for January, 1901.) Size $10 \times 6\frac{1}{2}$, pp. 40. *Map and Illustrations.*

Central Africa—Lake Kivu. *Deutsche Kolonialzeitung* 18 (1901): 124-125. Singer

Neuere Forschungen im Gebiete des Kivusees. Von H. Singer.

An examination of the results of the Moore and von Beringe expeditions.

International Conventions. Rouard de Card

Les territoires Africains et les Conventions Franco-Anglaises. Par E. Rouard de Card. (Bibliothèque Internationale et Diplomatique, xxxviii.) Paris: A. Pedone, 1901. Size 9×6 , pp. 242. *Maps. Price 6s. 6d.*

A summary of boundary questions between France and England and their settlement, with the text of the principal conventions.

Kamerun. *Deutsch. Kolonialblatt* 11 (1900): 934-936. —

Erkundung des Keakagebietes. *With Map.*

On the German districts adjoining the upper Cross river.

Madagascar. *Miss. Catholiques* 33 (1901): 55-59, 70-71. Fertineau

Madagascar-Nord. En exploration. Par le R. P. Fertineau. *With Sketch-maps and Illustrations.*

Account of a journey in the provinces of Vohemar and Diégo Suarez.

Madagascar, etc. Piolet and Noufflard

Madagascar, la Réunion, Mayotte, les Comores, Djibouti. Préface par Chailley-Bert. Texte par le R. P. Piolet et Ch. Noufflard. Paris: Firmin-Didot & Cie, and A. Challamel [not dated]. Size $13 \times 9\frac{1}{2}$, pp. 218. *Illustrations. Price 20s.*

This profusely illustrated work is the first issue of a series in which it is proposed to put before the French public a clear account of the French Colonial empire and its resources.

Madagascar—Geology. *C. Rd.* 132 (1901): 439-441. Lacroix

Sur la province pétrographique du nord-ouest de Madagascar. Note de M. A. Lacroix.

Marocco. *Jahresb. G. Ges. München* (1898-1899): lxvi.-lxviii. Pfeil

Ueber Marokko. Von Joachim Graf v. Pfeil.

Marocco. *B.S.G. Lille* 34 (1900): 333-340. Salone

Le Maroc. Par M. E. Salone.

In great part a vindication of French claims to Marocco. Except Rohlf's and Holler (*sic.*, ? Hooker), the writer alleges that all Moroccan explorers have been French!

Marocco—Language. Lerchundi

Rudiments of the Arabic-Vulgar of Morocco. With numerous exercises, and examples of its theory and practice. By the Very Reverend Father Joseph Lerchundi. Translated and adapted to English from the Second Spanish edition, by James Maciver Macleod. Tangier, 1900. Size $9 \times 6\frac{1}{2}$, pp. xxiv., 444, and 42. *Presented by the Editor.*

North-East Africa. *J. Tyneside G.S.* 4 (1901): 323-343. **Koettlitz.**

A Journey through Somali Land and Southern Abyssinia to the Berta or Shangalla Country and the Blue Nile, and through the Sudan to Egypt. By Dr. Reginald Koettlitz. *With Illustrations.*

North-East Africa. *Verh. Ges. Erdk. Berlin* 27 (1900): 477-486. **Erlanger and Neumann.**

Herr Carlo Frhr. v. Erlanger und Herr Oscar Neumann über Reisen in Nordost-Afrika.

See notes, *ante*, pp. 190, 528.

North-East Africa. *B.S.G. Italiana* 2 (1901): 240-246. **Vannutelli.**

La spedizione Donaldson Smith tra il lago Rodolfo e il Nilo. Nota del L. Vannutelli. *With Map. Also separate copy, presented by the Author.*

Nigeria. **Gallwey.**

Southern Nigeria. Report for 1899-1900. Colonial Reports, Annual No. 315, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 38. *Price* 2½d.

An abstract of this report appears on p. 661, *ante*.

Nigeria—Benin. *M.G. Ges. Wien* 44 (1901): 9-28. **Heger.**

Die Alterthümer von Benin. Von F. Heger.

Sahara and Sudan. **Foureaux.**

Renseignements Colon., Comité l'Afrique Française, No. 1 (1901): 1-15.

La mission Saharienne: Compte rendu de M. Foureaux. *With Map and Portraits.*

A reproduction of M. Foureaux's paper at the Paris Geographical Society.

Sahara and Sudan. *Rev. G.* 48 (1901): 59-67. **Foureaux.**

Réception de la mission Saharienne (Foureaux-Lamy). Par la Société de Géographie à la Sorbonne (5 décembre 1900). *With Map.*

The map is a reproduction of that published in *La Géographie*.

Sierra Leone. **Crooks.**

A Short History of Sierra Leone (with Maps, Illustrations, and Appendices) for the use of the Schools of the Colony. By Major J. J. Crooks. Dublin: The Nation Printing and Publishing Co., 1900. Size $6\frac{1}{2} \times 4\frac{1}{2}$, pp. viii. and 214. *Presented by the Author.*

This is little more than a summary of facts in chronological order, without attempt at correlation, and therefore possesses little educational value. Some inaccuracies occur, geographical names especially being often wrongly spelt. Thus we find Cumene, Elobz (for Elobe), Coriso (for Corisco), Annobotte (for Annobon). Some of the information is, however, useful, as not easy to obtain elsewhere.

South Africa—Native Races. *Nineteenth Century* 49 (1901): 367-376. **Macdonell.**

The Question of the Native Races in South Africa. By John Macdonell, C.B.

South Africa—Ngamiland. *Z. Ges. Erdk. Berlin* 35 (1900): 342-364. **Elsner.**

Die Höhenverhältnisse des Ngami-Landes nach den Beobachtungen von Dr. S. Passarge. Von G. v. Elsner.

South Africa—Transvaal. *Nineteenth Century* 49 (1901): 226-239. **Markham.**

The Economic Outlook in the Transvaal. By Arthur B. Markham, M.P.

Togoland. *Deutsche Kolonialzeitung* 18 (1901): 13. **Fies.**

Bilder aus Ho in Deutsch-Togo. Von K. Fies. *With Illustrations.*

The Ho are a tribe on the western border of Togoland.

Tripoli. *B.S.G. Com. Bordeaux* 26 (1900): 189-194, 209-222. **Girard.**

La Tripolitaine ou Régence de Tripoli. Par B. Girard.

Tripoli. *Jahresb. G. Ges. München* (1898-1899): xliii.-xlv. **Grothe.**

Ueber Tripolitanien, Landschaftsbilder und Völkertypen. Von Dr. L. H. Grothe.

Tunis. *M.G. Ges. Wien* 43 (1900): 300-312. **Jung.**

Tunis unter französischer Verwaltung. Von Dr. Emil Jung.

NORTH AMERICA.

America—Discovery. *Riv. G. Italiana* 8 (1901): 145-151. **Uzielli.**

La Scoperta dell' America al Congresso degli americanisti del 1900 di Gustavo Uzielli.

This deals mainly with the attempts of MM. de la Rosa and Vignaud to prove that the supposed letter of Toscanelli to Fernando Martins is a forgery.

American Fishes.

Jordan and Everman.

B.U.S. National Museum, No. 37, Pt. iv. (1900): 3137-3314.

The Fishes of North and Middle America. By D. S. Jordan, PH.D. and B. W. Evermann, PH.D. Part iv. *With Plates*.

Canada.

J. School G. 5 (1901): 85-88.

Davis.

Local Illustrations of Distant Lands. II. The Lakes and Rivers of the Laurentian Highlands. By W. M. Davis.

The features of the Laurentian highlands are illustrated by comparison to an arched roadway, from which a covering of snow and ice is melting.

Canada.

Solimbergo.

Il Canada sotto l'aspetto economico e politico. Rapporto del Comm. Giuseppe Solimbergo. (Bol. Ministero degli Affari Esteri. Marzo 1901.) Roma, 1901. Size 9 × 6½, pp. 40.

Canada—British Columbia.

Tide Tables for 1901 for Victoria, B.C. and Sand Heads, Fraser River, in the Strait of Georgia. With approximate Tidal Differences for Esquimalt, Vancouver, New Westminster, and Nanaimo. Issued by the Tidal Survey branch of the Department of Marine and Fisheries of the Dominion of Canada. Ottawa, 1900. Size 10 × 6½, pp. 16.

Canada—Rocky Mountains.

Collie.

Explorations in the Canadian Rocky Mountains. By Prof. J. Norman Collie, F.R.S. (From the *Geographical Journal* for March, 1901.) Size 10 × 6½, pp. 22. *Maps and Illustrations*.

Canada—Tides and Currents.

Dawson.

Survey of Tides and Currents in Canadian Waters. Report of Progress. By W. Bell Dawson. Ottawa, 1901. Size 10 × 6½, pp. 14.

United States National Museum.

Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1898. Report of the U.S. National Museum. Washington, 1900. Size 9½ × 6, pp. xviii. and 1294. *Plates. Presented by the Smithsonian Institution*.

United States—Population. *B. American G.S.* 32 (1900): 478-489.

Gannett.

The Population of the United States. By Henry Gannett.

A summary of the results of the recent census.

United States—Tacoma. *Deutsche Rundschau G.* 23 (1901): 145-157.

Röll.

Die westamerikanische Hafenstadt Tacoma und ihre Umgebung. Von Dr. Julius Röll. *With Illustrations*.

United States—Washington—Cascade Mountains.

Russell.

A Preliminary Paper on the Geology of the Cascade Mountains in Northern Washington. By Israel C. Russell. Extract from the Twentieth Annual Report of the U.S. Geological Survey, 1898-99. Part ii.—General Geology and Paleontology. Washington, 1900. Size 12 × 8, pp. 83-210. *Maps and Plates. Presented by the U.S. Geological Survey*. See note, *ante*, p. 662.

United States and Canada. *B. American G.S.* 32 (1900): 465-470.

Goode.

The North-Western Boundary between the United States and Canada. By Richard U. Goode. *With Index-map*.

A summary of the facts relating to the survey of the United States boundary with Canada in the west, which in many localities has never been accurately located.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *B.S.G. Madrid* 42 (1900): 169-173.

Carrasco.

Influencia de la población española en los progresos de la República Argentina. Por D. Gabriel Carrasco. *With Diagram*.

Argentine Republic.**Nagar.**

L'Agricoltura, il Commercio e le Industrie della Repubblica Argentina nel 1900. Rapporto del cav. Carlo Nagar. (Bollettino del Ministero degli Affari Esteri. Gennaio, 1901.) Roma, 1901. Size $9 \times 6\frac{1}{2}$, pp. 44.

Argentine Republic—Races.**Quevedo.**

Samuel A. Lafone Quevedo, M.A. La raza pampeana y la raza guarani ó los indios del Rio de la Plata en el siglo XVI. (Artículo publicado en el Tomo V. de los resultados del Congreso Científico Latino-Americano de 1898.) Buenos Aires, 1900. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 112. *Presented by the Author.*

Argentine Republic—Staten Island.**Arctowski.**

Henryk Arctowski. Résultats d'observations météorologiques faites à l'île des Etats. (Extrait de la revue *Ciel et Terre*, 21^e année.) Bruxelles: P. Weissenbruch, 1900. Size 9×6 , pp. 12. *Presented by the Author.*

A summary of the results of the first year's observations on Staten island.

Bolivia and Peru.**Forbes.**

Sociedad Geográfica de La Paz. Geología de Bolivia y del Sud del Perú. Por David Forbes. Traducida por Edmundo Sologuren. La Paz, 1901. Size $8\frac{1}{2} \times 6$, pp. xxiv. and 116. *Map and Sections. Presented by the Soc. Geogr. de La Paz.*

Translation of a memoir published in the *Quarterly Journal of the Geological Society* in 1861.

Brazil.**Ackermann.**

Au Pays du Caoutchouc. Par Eugène Ackermann. Rixheim: F. Sutter & Cie, 1900. Size 8×5 , pp. 62. *Illustrations. Presented by the Author.*

This contains two separate papers, the first on the Para rubber industry, the second on the conditions of life, etc., in the Amazon valley.

Brazil.*B.S.R.G. d'Anvers* 25 (1901): 83-128.**Courboin.**

Chez les Indiens, notes et souvenirs d'un séjour dans l'Amazonie. Par M. Albert Courboin. *With Illustrations.*

Somewhat discursive notes on the Indians of the Amazon valley, including some little-known tribes of the upper Yurua which the author visited.

Brazil.*Le Globe, B.S.G. Genève* 12 (1900-1901): 49-63.**Huber.**

Aperçu géographique de la région du Bas-Amazone. Par M. le Dr. J. Huber.

The author, who belongs to the staff of the 'Musée de Para,' describes the physical features of the Amazon below Obidos.

Brazil.*La G., B.S.G. Paris* 3 (1901): 123-132. **Huber and Kraatz-Koschlau.**

Entre l'Océan et le Rio Guama. Par J. Huber et von Kraatz-Koschlau. *With Map and Illustrations.*

An instructive sketch of the relations between soil, vegetation, and man in the districts east of the Para estuary.

Brazil.**Pio di Savoia.**

L'agricoltura, l'industria e il commercio nello Stato di Santa Caterina, Brasile. Rapporto del cav. Gherardo dei principi Pio di Savoia. (Boll. Ministero degli Affari Esteri. Gennaio, 1901.) Roma, 1901. Size $9\frac{1}{2} \times 6\frac{1}{2}$, pp. 22.

Brazil—Rio Tapajós.*Globus* 79 (1901): 37-41.**Katzer.**

Zur Ethnographie des Rio Tapajós. Von Dr. Friedrich Katzer. *Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.**Australia.***J.S. Arts* 49 (1901): 381-393.**Cockburn.**

The Commonwealth of Australia. By the Hon. Sir John A. Cockburn.

Australia—Aborigines.*P. American Philosoph. S.* 39 (1900): 556-578.**Matthews.**

The Origin, Organization, and Ceremonies of the Australian Aborigines. By R. H. Matthews, L.S. *With Map.*

Australia—Discovery.*R.G.S. Australasia (Victoria)* 18 (1900): 31-39.**Gordon.**

Notes on De Quiros' Voyage. By George Gordon.

Australia—Discovery.*R.G.S. Australasia (Victoria)* 18 (1900): 43-56.**Thomson.**

Did De Quiros land at Port Curtis? By Captain W. O. Thomson.

These two papers supply a further refutation of the extraordinary theory of Cardinal Moran that Quiros discovered Australia (cf. *Journal*, vol. xvi. p. 479).

Caroline Islands—Yap. *Verh. Ges. Erdk. Berlin* 28 (1901): 62–76. **Volkmann**

Herr Prof. Dr. G. Volkmann: Ueber die Karolinen Insel Yap. *With Map.*

A clear account of the physical geography, climate, population, and resources of the island of Yap.

German New Guinea. **Messerschmitt and Moisel**

M. Deutsch. Schutzgeb. 14 (1901): 63–72.

Resultate der astronomischen Beobachtungen von Dr. Lauterbach in Neu-Guinea. Bearbeitet von Dr. J. B. Messerschmitt. Begleitworte zu der Karte des Ramufusses. Von Max Moisel. *With Map.*

The map is based on the survey of the Ramu executed by Dr. Lauterbach in 1896 and 1899. The results of the two surveys are said to agree well. The river is shown to have an extremely winding course.

German New Guinea. *Deutsch. G. Blätter* 24 (1901): 1–9. **Wiedemann**

Ein Besuch in Herbertshöhe. Von Dr. Max Wiedemann.

Marianne Islands—Tinian. *Deutsch. Kolonialblatt* 12 (1901): 150–154. **Fritz**

Die Insel Tinian (Marianen). *With Illustrations.*

New Caledonia. *B.S.G. Lyon* 17 (1901): 155–167. **Russier**

La colonisation agricole en Nouvelle-Calédonie. Par M. Russier. *Illustrations.*

New Zealand—Taupo Plains. **Pond and MacLaurin**

T. and P. New Zealand I., 1899, 32 (1900): 227–241.

The Composition of the Soil of the Taupo Plains, and its Suitability for the Growth of Grasses. By J. A. Pond and J. S. MacLaurin, D.Sc.

Pacific—Volcanoes. *T. and P. New Zealand I.*, 1899, 32 (1900): 188–212. **Phillips**

On the Volcanoes of the Pacific. By Coleman Phillips.

Pitcairn Island. *J. Anthropol.* 30 (1900): 83–88. **Brown**

Stone Implements from Pitcairn Island. By J. A. Brown. *With Plate. Also separate copy, presented by the Author.*

Western Australia. **Blatchford**

The Phillips River Mining District. By Torrington Blatchford. (Western Australia Geological Survey, Bulletin No. 5.) Perth, 1900. Size 8½ × 6, pp. 22. *Map. Presented by the Geological Survey of Western Australia.*

POLAR REGIONS.

Antarctic Expedition. *Verh. Ges. Erdk. Berlin* 28 (1901): 163–171. **Borchgrevink**

Herr C. E. Borchgrevink: Die Antarktische Expedition des Southern Cross in den Jahren 1898–1900. *With Map and Plates.*

Virtually a condensed translation of the paper which appeared in the *Journal*. The error in the map there published, as regards east and west longitude, to which attention was subsequently drawn, is reproduced, as is also a discrepancy between the text and the map as to the date of reaching farthest south.

Antarctic Exploration. **Arctowski**

Exploration of Antarctic Lands. By Henryk Arctowski. (From the *Geographical Journal* for February, 1901.) Size 10 × 6½, pp. 32. *Maps and Illustrations.*

Antarctic—German Expedition. **Kretschmer**

Die Deutsche Südpolarexpedition. Von Kretschmer. Berlin: E. S. Mittler und Sohn, 1900. Size 9½ × 6½, pp. 30. *Map and Plans.*

Contains a full description of the German ship *Gauss*.

Antarctic—Icebergs. *C. Rd.* 132 (1901): 725–726. **Arctowski**

Sur les icebergs tabulaires des régions antarctiques. Note de M. Henryk Arctowski.

Antarctic Regions—Meteorology. **Arctowski**

Sur les conditions météorologiques des régions antarctiques. (Extrait de la *Revue Ciel de Terre*, 21^e année. No. du 16 Octobre 1900.) Size 9 × 6, pp. 6.

Arctic—Ice-conditions. **Garde**

The State of the Ice in the Arctic Seas, 1900. Prepared by V. Garde. (Special print of the nautical-meteorological annual of the Danish Meteorological Institute.) Size 12½ × 9½, pp. xviii. *Maps.*

See note, *ante*, p. 436.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

- Barometric Altitudes.** *Meteorolog. Z.* 18 (1901): 49-53. **Mohn.**
 Einige Bemerkungen über die Schwere-korrekturen der Barometerhöhen. Von Prof. H. Mohn.
- Climate.** *Quarterly J.R. Meteorolog. S.* 27 (1901): 1-62. **Ekholm.**
 On the Variations of the Climate of the Geological and Historical Past and their Causes. By Dr. Nils Ekholm.
 A revised and enlarged translation of a paper which appeared in *Ymer* in 1899.
- Cosmogony.** **Kant and Hastie.**
 Kant's Cosmogony as in his Essay on the Retardation of the Rotation of the Earth and his Natural History and Theory of the Heavens. With Introduction, Appendices, and a Portrait of Thomas Wright of Durham. Edited and Translated by W. Hastie, D.D. Glasgow: James Maclehose & Sons, 1900. Size 8 × 6½, pp. cx. and 206. *Presented by the Publishers.*
 This will be specially noticed.
- Deviation of Rivers.** *Mouvement G.* 18 (1901): 151-154. [**Marchand and Fabre.**]
 La rotation terrestre et l'orientation des cours d'eau.
 Extracted from a recent memoir by MM. Marchand and Fabre, who, by a series of mathematical calculations, have come to the conclusion that the rotation of the Earth exercises an inappreciable influence on the direction of flow of rivers.
- Kumatology.** **Cornish.**
 On the application of the Study of Waves to Geography. Paper read at the International Geographical Congress of Berlin in 1899. By Vaughan Cornish, M.Sc. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 207-212. *Presented by the Author.*
- Meteorology.** *Meteorolog. Z.* 18 (1901): 10-16. **Valentin.**
 Einige Ergebnisse der österreichischen Luftballons bei der internationalen Fahrt am 12. Mai 1900. Von J. Valentin.
- Meteorology—Auroras.** **Arctowski.**
 Sur les aurores australes et boréales. Par Henryk Arctowski. (Extrait de la revue *Ciel et Terre*, 21^e année.) Bruxelles: P. Weissenbruch, 1901. Size 9½ × 6½, pp. 20.
- Meteorology—Balloon observations.** *G.Z.* 7 (1901): 121-140. **Hann.**
 Wissenschaftliche Luftfahrten. Von J. Hann.
 Review of the scientific results of balloon ascents recently published in Germany by Assmann and Berson.
- Moels.** **Marr.**
 The Origin of Moels, and their subsequent dissection. By J. E. Marr, F.R.S. (From the *Geographical Journal* for January, 1901.) Pp. 6. *Illustrations.*
- Seismology.** *Brit. Assoc. Rep.* (1900): 59-120. ———
 Seismological Investigations. Fifth Report of the Committee. *With Maps and Diagrams.*
- Subterranean Waters.** *J. Franklin I.* 151 (1901): 182-194. **Morris.**
 Subterranean Waters. By Charles Morris.
- Terrestrial Magnetism.** *C. Rd.* 132 (1901): 317-320. **Angot.**
 Sur la variation diurne de la déclinaison magnétique. Note de M. Alfred Angot.
- Terrestrial Magnetism.** **Fritsche.**
 Die elemente des Erdmagnetismus und ihre saecularen Aenderungen während des Zeitraumes 1550 bis 1915. Von Dr. H. Fritsche. Publication iii. St. Petersburg, 1900. Size 9 × 6½, pp. 62.
- Tides.** *B. American G.S.* 32 (1900): 471-477. **Brownlie.**
 The Science of the Tides. By Alexander Brownlie. *With Sketch-maps.*

BIOGRAPHY.

- Buch.** *Deutsche Rundschau G.* 23 (1901): 277-279. —
 Leopold v. Buch. *With Portrait.*
 This celebrated German *savant* was born in 1774, and died in 1853.
- Drapeyron.** *Rev. G.* 48 (1901): 161-169. **Regelsperger.**
 Ludovic Drapeyron. Par G. Regelsperger. *With Portrait.*
- Hartlaub.** *Deutsch. G. Blätter* 24 (1901): 38-42. —
 Dr. med. Gustav Hartlaub.
 Dr. G. Hartlaub, chiefly known as an ornithologist, died Nov. 20, 1900, aged 87.
- Kiepert.** *G.Z.* 7 (1901): 1-21, 77-94. **Partsch.**
 Heinrich Kiepert. Ein Bild seines Lebens und seiner Arbeit. Von J. Partsch.
- Pullar.** *Scottish G. Mag.* 17 (1901): 148-150. **Chumley.**
 The late F. P. Pullar. By James Chumley.
- Ruge.** *Globus* 79 (1901): 174-175. **Kohut.**
 Sophus Ruge. Zu Seinem 70. Geburtstage, 26 März, 1901. Von Dr. A. Kohut.
With Portrait.
- Torell.** *Naturw. Wochenschrift* 16 (1901): 69-73. **Wahnschaffe.**
 Erinnerungen an Otto Torell. Von Prof. Dr. Felix Wahnschaffe. *With Portrait.*
 This well-known Swedish geologist was born June 5, 1828, and died Sept. 11, 1900.

GENERAL.

- Bibliography.** —
 The English Catalogue of Books for 1900. London: Low & Co., 1901. Size 10 x 6½, pp. 266. Price 6s. net.
- Bush Fires.** **Nicholls.**
 The Harmfulness of Bush Fires. By Dr. H. A. Alford Nicholls, c.m.g. (Imperial Department of Agriculture for the West Indies. Pamphlet Series, No. 4.) Issued by the Commissioner of Agriculture. 1901. Size 7 x 5, pp. 30. *Presented by the Imperial Department of Agriculture for the West Indies.*
 The writer calls attention to the harm done by the careless use of fire for clearing new ground, forests having been destroyed all over the West Indies by this means.
- Colonies.** *L'Esplorazione Com.* 16 (1901): 4, 17, 49, 65. **Pini.**
 E. Pini: Un po' di bilancio coloniale del secolo XIX.
 On the development of European colonies during the nineteenth century.
- Commerce.** —
 Review of the World's Commerce. Introductory to Commercial Relations of the United States with Foreign Countries during the year 1900. Issued from the Bureau of Foreign Commerce, Department of State. Washington, 1901. Size 9½ x 6, pp. 252. *Map.*
- Comparative Geography.** *Ann. G.* 10 (1901): 1-9. **Mehedinți.**
 La géographie comparée d'après Ritter et Peschel. Par Dr. S. Mehedinți.
- Congress.** *B.S.G. Lille* 35 (1901): 134-148, 246-258. —
 Congrès international de Géographie économique et commerciale.
- Education.** **Bourgoin.**
 Organisation de l'Enseignement Post-scolaire de la Géographie économique. Par G. Bourgoin. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude. IV^e Section—Question iii.) Paris: Société de Géographie Commerciale. Size 10½ x 7, pp. 14.
- Education.** *B. American G.S.* 32 (1900): 490-496. **Dodge.**
 Notes on Geographical Education. By Richard E. Dodge.
- Educational.** *J. School G.* 4 (1900): 331-342. **Burrows.**
 The Teaching of Geography in Preparatory Schools. By F. R. Burrows.
- Educational.** **Reclus.**
 L'enseignement de la Géographie. Globes, Disques globulaires et Reliefs. Par Elisée Reclus. (Université Nouvelle, Institut Géographique de Bruxelles. Publication No. 5.) Bruxelles, 1901. Size 10 x 6½, pp. 10.

Educational—Map-drawing. *J. School G.* 5 (1901): 81-85. **Carter.**

A Method of Map Drawing. By C. C. Carter. *With Illustration.*

The writer suggests, for school purposes, the use of a simplified form of degree-net, coinciding with no true projection, the parallels being represented by straight lines, and the lengths of 1° of longitude in various latitudes taken at figures easily expressed in proportional parts. While practicable for maps of certain countries, this would hardly be suitable for, say, a map of Asia.

Educational—Maps. *Riv. G. Italiana* 8 (1901): 185-189. **Biasutti.**

Le carte topografiche nell' insegnamento della geografia di Renato Biasutti.

Educational—Weather. *J. School G.* 5 (1901): 51-59. **Jefferson.**

Weather Map Exercises. By M. S. W. Jefferson.

Fishing Fleets. [Lindeman.]

Die Fischerflotten der Welt. [From the *Jahrbuch des Deutschen Flottenvereins*, 1901.] Size 7 × 5, pp. 636-644. *Presented by the Author.*

French Colonies. **Noll.**

Almanach du Marouin 1901. 8^e Année. Annuaire Illustré de l'Armée Coloniale. Par Ned Noll. Paris: H. Charles-Lavauzelle. Size 11 × 7½, pp. 160. *Maps and Illustrations.* Price 2 fr. *Presented by the Publisher.*

Contains reviews of progress during 1900 in the various French possessions abroad, especially in Africa.

Geography. **Dryer.**

The Organization of Geography. By Charles Dryer. [From the *Educational Review*, January, 1901. Pp. 26-38.] Size 10 × 6½.

A thoughtful paper on the scope of geography as an educational subject, about which opinions still so much differ. The writer justly protests against the attempt to narrow and specialize the study of physical geography as a subject in itself, leaving Man out of consideration.

Labour Question. **Feist.**

De la main-d'œuvre agricole dans les Colonies et spécialement du métayage (Soudan Français). Par le capitaine Feist. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude III^e section—Question ii.) Paris: Société de Géographie Commerciale. Size 11 × 7, pp. 6.

Money. **Norman.**

Lecture upon Locke's School of Money. The principles and practice of Locke's "School of Money" and unsound currency substitutes for money, 1695, arithmetically unveiled to the easy comprehension of travellers, sailors, and soldiers of to-day. By J. H. Norman. London: Gilbert & Rivington, 1900. Size 9 × 6, pp. 58. *Presented by the Author.*

Population. **Keltie.**

The Population of Uncivilized Countries. Paper read at the International Geographical Congress of Berlin in 1899, by J. Scott Keltie, LL.D. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 511-516.

On a scheme drawn up by Dr. Kiær, Director of the Norwegian Statistical Bureau, for the more accurate estimation of the population of Uncivilized Countries.

Statistics. **Szende.**

Földrajz-statisztikai tabellák a föld összes államairól. 1898. Összeállította. Szende Gyula, Budapest. Size 10½ × 7, pp. 212. *Diagrams.*

Geographical-Statistical tables for all the countries of the world.

Telegraphic Cables. *A travers le Monde, Tour du Monde* 7 (1901): 85.

Les câbles télégraphiques allemands. *With Map.*

Text-book. **Ule.**

Grundriss der Allgemeinen Erdkunde. Von Prof. Dr. Willi Ule. Leipzig: S. Hirzel, 1900. Size 9½ × 6½, pp. viii. and 396. *Illustrations.* Price 9s.

NEW MAPS.**By E. A. REEVES, Map Curator, R.G.S.****EUROPE.****Crete.****Service Géographique de l'Armée, Paris.**

Ile de Crète. Scale 1 : 400,000 or 6·3 stat. miles to an inch. Service Géographique de l'Armée, Paris. *Price 1 fr.*

Denmark.**Danish General Staff.**

Generalstabens topografiske Kaart over Danmark. Scale 1 : 40,000 or 1·5 inch to a stat. mile. Kalkograferet og graveret ved Generalstaben, Kjöbenhavn, 1900. Sheets: Jerslev, Brönderslev, Blokhüs, Tranum Strandhuse, Søby, Torslev, Börghlum, Lökken. *Presented by the Danish General Staff.*

England and Wales.**Ordnance Survey.**

ORDNANCE SURVEY OF ENGLAND AND WALES:—Revised sheets published by the Director-General of the Ordnance Survey, Southampton, from April 1 to 30, 1901.

1-inch—General Maps:—

Printed in colours, 4, 13, 15. 1s. each.

Towns and country around, with roads printed in colour—Torquay, 1s. 3d.

Diagram of London, printed in colours, showing unions, boroughs, and civil parishes; also the 1 : 2500 scale sheet lines. 3s.

6-inch—County Maps:—

Carnarvonshire, 4 s.w., 7 n.e., s.w., 8 n.w., 11 n.e., s.e., 15 s.w., 16 s.w., s.e., 17 n.w., s.w., 18 n.w., 20 s.e., 21 s.w., s.e., 25 s.e., 26 s.e., 27 s.w., 28 n.w., 29 n.e., 31 n.e., s.w., 33 s.w., s.e., 38 s.e., 39 n.w., s.w., s.e., 40 s.w., 41 n.w., 42 n.w., 43 s.w., 45 n.w., 46 n.e. (47 n.e. and 48 n.w.). Cumberland, 4 s.e., 8 s.w., s.e., 9 n.w. (9A s.w. and 15 n.w.), (9B s.w. and 14 n.w.), (9B s.e. and 14 n.e.), 13A n.e. (14 n.w. and 9B s.w.), 14 n.e. and 9B s.e.), (15 n.w. and 9A s.w.), 15 s.w., 18 n.w., 19 n.w., 2 n.e., 20 (s.w. and s.e.), 21 s.e., 22 n.e., 23 s.w., 25 n.w., 27 n.w., s.w., 28 n.e., 31 s.w., 32 s.w. Derbyshire, 40 s.w., 41 s.w., 45 n.e., 51 n.w. Glamorgan, 2 n.w., s.w., 6 n.w., 12 n.e., s.e., 19 s.e., 28 s.e., 46 n.e., 47 s.w. Merionethshire, 4 n.e. Monmouthshire, 16 n.e. Northamptonshire, 6 s.e., 12 n.e., s.e., 13 s.w., 16 n.e. s.w., s.e., 17 n.e., s.e., 18 n.w., s.e., 24 n.e., 25 s.e., 26 n.w., s.e., 27 n.w., 31 n.w., 32 n.w., 37 s.e., 45 s.e. Nottinghamshire, 4 n.w., n.e., 32 s.w., 37 s.e., 41 n.w., 48 n.w., 46 n.e., 49 n.e. Staffordshire, 18 s.e. Wiltshire, 26 s.w., 33 s.e., 40 s.e., 46 n.e., s.w., 47 n.w., s.e., 48 s.e., 49 s.w., 52 n.e. 1s. each.

25-inch—Parish Maps:—

Bedfordshire, XII. 10, 13; XVI. 10, 11, 14, 15, 16; XVII. 8, 10, 13, 14, 16; XVIII. 13, 15, 16; XX. 2, 3, 4, 6, 7, 8, 11, 12, 15, 16; XXI. 1, 3, 4, 5, 6, 10, 12, 13; XXII. 1, 2, 3, 12, 16; XXIII. 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15; XXIV. 2, 7, 8; XXV. 4; XXVII. 1, 3, 5, 6, 9, 10; XXXII. 2; XXXIII. 1, 6. Derbyshire, XLVII. 8; XLIX. 12, 16; L. 9; LIII. 1, 2, 3, 7, 9, 10, 11, 12, 14, 16; LIV. 3, 13, 14; LV. 1, 2. Merionethshire, IX. 13; XXVI. 9, 13, 14, 15; XXVII. 13, 15; XXIX. 10; XXXI. (4 and 3), 8; XXXII. 1, 2, 6, 9, 11, 12, 13; XXXIII. 2, 3, 4, 6, 8, 9, 10, 11, 12; XXXIV. 9; XXXVI. 1, 10, 12; XLI. 1, 2, 6, 10. Monmouthshire, VI. 4, 5, 6, 7, 8, 9, 10; VII. 2, 4, 6, 8, 9, 14, 15, 16; XI. 16; XII. 3, 4, 6, 8; XVII. 1, 7, 11, 15; XXII. 11. Shropshire, I. (11 and 12). Staffordshire, XXIII. 3, 4; XXIV. 3, 6, 8, 12, 13, 15; XXV. 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXVI. 1, 5, 9, 13; XXXIII. 9, 10, 11, 13, 14, 16; XXXIV. 13. Wiltshire, XXXII. 14; XXXVIII. 7, 8; XLIV. 2; XLV. 1, 5, 9, 13; LI. 3; LII. 1, 14; LIV. 16; LVIII. 4; LXI. 13, 16; LXIV. 4, 12, 14, 15, 16; LXV. 9, 10, 13; LXVII. 1, 2, 6, 7, 8, 10, 11; LXIX. 2, 3, 10; LXXV. 3. 3s. each.

(*E. Stanford, London Agent.*)

Germany.**Königl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1 : 100,000 or 1·6 stat. mile to an inch. Sheets: 255, Laar; 284, Lübbecke; 308, Bielefeld; 333, Detmold; 334, Höxter; 359, Uslar. Herausgegeben von der Kartogr. Abtheilung der Königl. Preuss. Landes-Aufnahme, 1900. *Price 1.50 marks each sheet.*

Rumania.**Military Geographical Institute, Bucharest.**

Government Surveys of Rumania: Foi din Moldova, 1 : 50,000. Sheets: Focşanii, Nomolósa, Mamornita, Herta, Galaţii, Darabani, Râdăuţi, Săveni, Răpicieni.—Foi din Muntenia, 1 : 50,000. Sheets: Sinaia, T. Urlati, Slobodia, Mihaiu-Bravul,

Educational—Map-drawing. *J. School G.* 5 (1901): 81-85. **Carter.**

A Method of Map Drawing. By C. C. Carter. *With Illustration.*

The writer suggests, for school purposes, the use of a simplified form of degree-net, coinciding with no true projection, the parallels being represented by straight lines, and the lengths of 1° of longitude in various latitudes taken at figures easily expressed in proportional parts. While practicable for maps of certain countries, this would hardly be suitable for, say, a map of Asia.

Educational—Maps. *Riv. G. Italiana* 8 (1901): 185-189. **Biasutti.**

Le carte topografiche nell' insegnamento della geografia di Renato Biasutti.

Educational—Weather. *J. School G.* 5 (1901): 51-59. **Jefferson.**

Weather Map Exercises. By M. S. W. Jefferson.

Fishing Fleets. [Lindeman.]

Die Fischerflotten der Welt. [From the *Jahrbuch des Deutschen Flottenvereins*, 1901.] Size 7 × 5, pp. 636-644. *Presented by the Author.*

French Colonies. **Noll.**

Almanach du Marouin 1901. 8^e Année. Annuaire Illustré de l'Armée Coloniale. Par Ned Noll. Paris: H. Charles-Lavauzelle. Size 11 × 7½, pp. 160. *Maps and Illustrations. Price 2 fr. Presented by the Publisher.*

Contains reviews of progress during 1900 in the various French possessions abroad, especially in Africa.

Geography. **Dryer.**

The Organization of Geography. By Charles Dryer. [From the *Educational Review*, January, 1901. Pp. 26-38.] Size 10 × 6½.

A thoughtful paper on the scope of geography as an educational subject, about which opinions still so much differ. The writer justly protests against the attempt to narrow and specialize the study of physical geography as a subject in itself, leaving Man out of consideration.

Labour Question. **Feist.**

De la main-d'œuvre agricole dans les Colonies et spécialement du métayage (Soudan Français). Par le capitaine Feist. (Congrès International de Géographie économique et commerciale. Rapports sur les questions mises spécialement à l'étude III^e section—Question ii.) Paris: Société de Géographie Commerciale. Size 11 × 7, pp. 6.

Money. **Norman.**

Lecture upon Locke's School of Money. The principles and practice of Locke's "School of Money" and unsound currency substitutes for money, 1695, arithmetically unveiled to the easy comprehension of travellers, sailors, and soldiers of to-day. By J. H. Norman. London: Gilbert & Rivington, 1900. Size 9 × 6, pp. 58. *Presented by the Author.*

Population. **Keltie.**

The Population of Uncivilized Countries. Paper read at the International Geographical Congress of Berlin in 1899, by J. Scott Keltie, LL.D. (Sonderabdruck aus den Verhandlungen des VII. Internationalen Geographen-Kongresses in Berlin, 1899.) Berlin, 1900. Size 10 × 6½, pp. 511-516.

On a scheme drawn up by Dr. Kiær, Director of the Norwegian Statistical Bureau, for the more accurate estimation of the population of Uncivilized Countries.

Statistics. **Szende.**

Földrajz-statisztikai tabellák a föld összes államairól. 1898. Összeállította. Szende Gyula, Budapest. Size 10½ × 7, pp. 212. *Diagrams.*

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Les câbles télégraphiques allemands. *With Map.*

Text-book. **Ule.**

Grundriss der Allgemeinen Erdkunde. Von Prof. Dr. Willi Ule. Leipzig: S. Hirzel, 1900. Size 9½ × 6½, pp. viii. and 396. *Illustrations. Price 9s.*

ASIA.

Formosa.**Military Survey Office, Tokyo.**

Map of the Island of Formosa. Scale 1: 200,000 or 3.1 stat. miles to an inch. Military Survey Office, Tokyo, 1900. 14 sheets. *Presented by K. Otani, Esq.*

Since Formosa was ceded to Japan, rapid progress has been made in its development, and the survey of the island, undertaken by the Military Survey Department, Tokyo, is already in an advanced condition. The first fourteen sheets published have been presented to the Society through the kindness of Mr. K. Otani. They form part of a map on the scale of 1: 200,000, and are very creditably produced, the relief being shown by black contour-lines. The lettering is in native character only, but it is to be hoped that later on an edition may be published with the names transliterated, as is the case with one of the government surveys of Japan.

AFRICA.

Algeria and Tunis.**Mager.**

Atlas d'Algérie et Tunisie. Par Henri Mager. Paris: Ernest Flammarion. Price 2 francs.

A little general atlas of Algeria and Tunis, containing useful statistical letterpress.

British South Africa.**Philip.**

Library Map of British South Africa. Scale 1: 2,500,000 or 40 stat. miles to an inch. G. Philip & Son, London and Liverpool, 1901. Price 3s. 6d. *Presented by the Publishers.*

This sheet contains altogether twelve maps and plans: a general map of the Cape Colony, Natal, Transvaal, Orange River Colony, and Southern Rhodesia, on the scale of 1: 2,500,000; a map of Northern Rhodesia, British Central Africa, and Portuguese East Africa, on half the scale of the former; a track-chart showing routes from England to South Africa; and plans of Cape Town, the Cape Peninsula, Port Elizabeth, Durban, Pietermaritzburg, Kimberley, Witwatersrand, and Pretoria. In addition to these, there is a map of south-east England on the same scale as the general map for comparison. These are all clearly drawn and printed in colours, and will doubtless be useful for reference, especially at the present time.

AMERICA.

United States.**U.S. Geological Survey.**

Topographic Atlas of the United States. Physical Geography of the Texas Region, by R. T. Hill. U.S. Geological Survey, Washington, D.C., 1900. *Presented by the U.S. Geological Survey.*

In addition to a general map of Texas, on the scale of 25 stat. miles to an inch, compiled by Mr. Robert T. Hill, this atlas contains five sheets showing types of mountains, plains, and other topographical features. There are also twenty-two characteristic views from photographs, and nineteen other interesting sketches and diagrams. The explanatory descriptive text is very complete, and contains a great deal of information on the physical geography and topography of Texas. The atlas forms the topographical basis for the geological map of the State, and, like all the other work undertaken by the United States Geological Survey, is most satisfactory.

Argentine Republic.**Delachaux.**

Atlas Meteorologico de la República Argentina. Primera parte. Provincia de Buenos Aires. By Enrique A. S. Delachaux. Buenos Aires: Compania Sud-Americana de Billetes de Banco, 1901. *Presented by the Author.*

This meteorological atlas of the province of Buenos Aires, which has been prepared by Señor Enrique A. S. Delachaux, of La Plata, forms the first part of a more extensive work which is to include the whole of the Argentine Republic. The present volume contains twenty-four carefully-executed little maps of the province of Buenos Aires, on the same scale (1: 4,000,000), indicating graphically the meteorological conditions of the province at all seasons of the year. Temperature, atmospheric pressure, direction of the wind, relative humidity of the atmosphere, and rainfall are all dealt with in a very creditable manner, and there is also a hypso-bathymetric map upon which the meteorological stations of the province are shown in red. The maps are all printed in colours, and each is accompanied by descriptive and explanatory letterpress.

South America.**Stanford.**

Library Map of South America. Scale 1: 5,274,720 or 83.25 stat. miles to an inch. London: E. Stanford, 1901. New edition. 4 sheets. Price £1 15s.

Stanford's series of library maps are well known, and have already passed through many editions. In this new edition of the map of South America many alterations and corrections have been made to bring it up to date, and a considerable amount of success has been attained, although there are some points that still need attention. The latest figures for the altitudes of some of the principal peaks in the Andes do not appear, and the boundary-line between Chile and the Argentine Republic, which is still in dispute, is laid down as if it were definitely settled. The direction taken by the line, as here shown, is certainly very questionable in some regions, as in the neighbourhood of Lake Buenos Aires, which is given to Chile.

GENERAL.

French Colonies.

Pelet.

Atlas des Colonies Françaises. Dressé par ordre du Ministère des Colonies par Paul Pelet. Paris: Armand Colin & Cie. Livraisons 5 and 6. *Price 3 francs each part.*

Parts 5 and 6 of this excellent atlas of the French colonies contain the following maps: Part 5, a map of Algeria in three sheets, the first of which gives the Province of Oran, the second the Province of Alger, and the third the Province of Constantine. In this part is also the text to accompany the map of the French Congo. Part 6 contains, No. 8, a map of Tunis, which adjoins and forms part of the map of Algeria in Part 5; No. 13, the northern sheet of the map of the French Congo, showing the upper Ubangi and Shari; and No. 14, entitled, "Côte Française des Somali et Dépendances." This title is, however, somewhat misleading, for the map includes all the region from Lake Tana, in Abyssinia, on the north, to Lake Rudolf on the south, and from the Bahr-el-Ghazel on the west to Zeila on the east. It is certainly difficult to see how the greater part of this vast region can be considered to be in any sense a dependency of French Somaliland. This sheet adjoins No. 13 to the east, and the two sheets together include the whole of Central Africa, between 3° 40' and 12° 20' N. lat., and from Lake Chad on the west to the Gulf of Aden on the East. The letterpress contained in the part refers to French Somaliland and Madagascar.

It is to be regretted that so much time is allowed to elapse between the drawing of the maps and their publication, as in some instances the information they contain is, in consequence, not up to date. This is the case with the last-mentioned map, which is dated January, 1900. Sheet No. 13 is dated even earlier than this, having been drawn in June, 1899.

CHARTS.

North Atlantic Ocean and Mediterranean Sea.

Meteorological Office, London.

Monthly Pilot Chart of the North Atlantic Ocean and Mediterranean Sea for May, 1901. Meteorological Office, London. *Price 6d. Presented by the Meteorological Office.*

United States Charts.

United States Hydrographic Office.

Pilot Chart of the North Pacific Ocean for May, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Russian Central Asia.

Demidoff.

Album containing 150 photographs of Russian Central Asia, taken during the journey of Prince Demidoff across Siberia and in Kamchatka, 1900. *Presented by Prince Demidoff.*

This album contains a selection of the photographs taken during Prince Demidoff's journey across Siberia *viâ* the Trans-Siberian Railway, and in Kamchatka, from April to October last year. Although all are interesting, perhaps those taken in Kamchatka have a special value from a geographical point of view. They are platinotypes of different sizes, and most of them are extremely clear and good.

(1 and 2) *Ovis Nivicola*, a ram; (3) *Ovis Nivicola*, a female; (4) My bag of *Ovis Nivicola*; (5) Pilgrim women outside the walls of the Kremlin; (6) Our party, Cheliabinsk; (7) Our carriage on the Trans-Siberian railway; (8) Local type of vehicle, Cheliabinsk; (9) The Yenesei bridge; (10) Village of Krasnoyarsk; (11) Train entering the Lake Baikal steamer, s.s. *Baikal*; (12) Type of locomotive, Trans-

Siberian Railway; (13) Withdrawing train from s.s. *Baikal* at Missovaya; (14) View of Irkutsk across the river Angara; (15) View of village of Baikal and hills surrounding the lake; (16 and 17) Our party on board s.s. *Baikal*; (18) The s.s. *Amur* on the Shilka; (19) The *Sungari* stern-wheeler, rear view; (20) The s.s. *Amur* on the Shilka; (21) A natural amphitheatre; (22) Roe deer, shot while crossing the river; (23) The Burning cliff, Amur river; (24 and 25) Old resident, banks of Amur river, showing summer and winter dwellings; (26) Street at Poyarkovo; (27) Enlarged view of the enormous rudders employed on the barges, Amur river; (28) Local cargo boat, Khabarovsk; (29) A Korean; (30) Korean types, Asswei railway; (31) On the railway; (32) Chinese; (33) At Vladivostok: the porters with our personal luggage; (34) My wife and Madame Tchitchagoff, the Governor's wife, Vladivostok; (35) Vladivostok: porters with baggage mounted; (36) Baggage going on board s.s. *Baikal* bound for Kamchatka; (37) Vladivostok; (38) Shipping at Vladivostok, s.s. *Rurik*, Russian cruiser; (39) First officer, s.s. *Baikal*; (40) A whaler; (41) Passing Japan; (42) Approaching the entrance to Avacha bay, Kamchatka; (43) Main street of Petropaulsk; (44) Petropaulsk bay and village; (45) Huts and enclosures, Petropaulsk; (46) Monument to La Perouse, Petropaulsk; (47) Monument to Behring, Petropaulsk; (48) Monument over the graves of Russians killed at Petropaulsk during the Crimean war; (49) Crimean monument, Petropaulsk; (50) Monuments over the graves of English and French killed at Petropaulsk; (51) Petropaulsk; (52) The Isprahvink's sledge and team of dogs; (53) Panorama of Petropaulsk; (54) Sledge and team of dogs; (55) Fine cariboo horns; (56) My dog "Kam"; (57) A Japanese boatman; (58) Panoramic view of our second camp, Avacha bay; (59) View of river Khutor; (60) Fish shed, Khutor; (61) Natchiki village and salmon stream; (62) Early morning on a Tundra mist on the mountains; (63) Our caravan, a midday rest; (64) Starting out salmon-fishing in dug-outs lashed together; (65) A forty-pounder; (66) A rise; (67) Salmon-trap, Bocheretzka river; (68) Preparing salmon for drying; (69) View along bank of river Bystraya at low water; (70) Ganai range; (71) Group of Kamchatkales, Nachiki; (72) Bear-skin window; (73) Sledge-dogs at home, showing burrows; (74) Sledge-dogs, showing method of tying up; (75) A ford; (76) Backwater, near a ford; (77) Our camp at Vershina, Kamchatka; (78) Kamchatskaia Vershina: extinct volcano; (79 and 79A), Lake Sofka Demidoff, headwaters of Kamchatka river; (80) A corner of Lake Sofka Demidoff; (81) On the war-path; (82 and 83) My best head, *Ovis Nivicola*; (84) The first day's bag (four sheep and four bears); (85) *Ovis Nivicola*, skin and head; (86) Our bag of "Bighorn," Vershina camp; (87) Myself; (88) My wife; (89) In camp; (90-94) Views around Lake Sofka Demidoff; (95) Keeping off mosquitos; (96) Cutting hair; (97) Washing-day; (98) Airing bedding, etc.; (99) Baking bread; (100 and 101) Our Chinese cook; (102) The "Admiral," my favourite hunter, and our cook; (103) The method of propulsion and steering; (104) Avacha river and hills; (105) In dug-outs on the Avacha; (106 and 107) Transporting the baggage; (108) Watching a shoal of salmon; (109 and 110) Details of salmon-trap; (111) Salmon caught in trap; (112 and 113) Removing salmon from trap; (114) Apportioning the catch; (115) Pit where the salmon is stored for the winter; (116) Carrying salmon on bent stick; (117) A pack-pony; (118) My three best heads; (119) A staircase; (120) A vicious pony; (121) Pack-horse and "Admiral;" (122) Taken unawares: Littledale asleep; (123) The head Korean s.s. *Tsizikar*; (124) s.s. *Tsizikar*, a collier which brought us back to Nikolaievsk; (125) Steward, cook, and boys, s.s. *Tsizikar*; (126) Castries bay, Gulf of Tartary; (127) Our camp outside Nikolaievsk; (128) Main street, Nikolaievsk; (129) Some of our baggage; (130-132) Types on the river Amur, Nikolaievsk to Khabarovsk; (133) Street, Khabarovsk; (134) Panoramic view of Khabarovsk; (135) Count Muravieff's statue, Khabarovsk; (136 and 137) A storm at Khabarovsk; (138 and 139) Guns recently captured from the Chinese, Blagaveschensk; (140) The triumphal arch, Blagaveschensk; (141) The square, Blagaveschensk; (142) On the Amur river; (143-145) Scenery on the Amur river; (146) Soldiers for the front, Amur river; (147) Military transport, Amur river; (148) Scenery on the Amur river; (149) General Boldieff and myself, on the railway Irkutsk to Moscow.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Scottish Provident Institution

ESTABL'D.
1837

INCORP'D.
1848

Family Settlements

IN the selection of an Assurance Office for the purpose of providing Capital Sums at Death to meet Family Settlements, Partnership or other Business Arrangements, Estate Duties, etc., the main question, after that of Absolute Security, is which Office will provide this Fund on *the most moderate terms*, without sacrifice of the valuable right to participate in the Surplus.

The system of the **Scottish Provident Institution** is specially suited for such requirements. The PREMIUMS are so moderate that, at usual ages for assuring, £1200 or £1250 may be secured from the first for the yearly payment which is generally charged (with profits) for £1000 only—the £200 or £250 being equivalent to an immediate and certain Bonus. The WHOLE SURPLUS goes to the Policyholders, on a system at once safe and equitable—no share being given to those by whose early death there is a *loss* to the Common Fund.

The SURPLUS at the last Septennial Valuation was **£1,423,000**
More than one-half of the Members who died during the Septennial period were entitled to **Bonuses** which, **notwithstanding** that the Premiums do not as a rule exceed the non-profit rates of other Offices, were on the average equal to an addition of about 50 per cent to the Policies which participated.

The next Division of Surplus takes place as at 31st Dec. 1901.

The Accumulated Funds exceed
Eleven and three quarter Millions

LONDON: 17 KING WILLIAM STREET, E.C.

HEAD OFFICE: 6 ST. ANDREW SQUARE, EDINBURGH.

SCOTTISH PROVIDENT INSTITUTION

TABLE OF PREMIUMS BY DIFFERENT MODES OF PAYMENT
For Assurance of £100 at Death—With Profits.

Age next Birth-day.	Annual Premium payable during Life.	ANNUAL PREMIUM LIMITED TO				Single Payment.	Age next Birth-day.
		25 Payments.	20 Payments.	15 Payments.	10 Payments.		
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
21	1 16 3	2 8 10	2 15 4	3 6 7	4 9 4	36 1 3	21
22	1 16 9	2 9 3	2 15 9	3 7 2	4 10 2	36 8 0	22
23	1 17 2	2 9 7	2 16 2	3 7 7	4 10 11	36 13 8	23
24	1 17 7	2 9 11	2 16 6	3 8 0	4 11 6	36 19 4	24
25	1 18 0	2 10 2	2 16 10	3 8 5	4 12 1	37 5 0	25
26	1 18 6	2 10 6	2 17 3	3 8 11	4 12 9	37 11 6	26
27	1 19 2	2 11 0	2 17 10	3 9 7	4 13 8	37 19 9	27
28	1 19 11	2 11 7	2 18 5	3 10 4	4 14 8	38 8 10	28
29	2 0 8	2 12 3	2 19 2	3 11 2	4 15 10	38 18 6	29
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31	2 2 6	2 13 9	3 0 9	3 13 1	4 18 5	40 0 6	31
32	2 3 5	2 14 8	3 1 9	3 14 2	4 19 11	40 12 8	32
33	2 4 6	2 15 7	3 2 9	3 15 5	5 1 6	41 5 8	33
34	2 5 7	2 16 8	3 3 10	3 16 8	5 3 2	41 19 4	34
35	2 6 10	2 17 9	3 5 0	3 18 0	5 5 0	42 13 9	35
36	2 8 2	2 19 0	3 6 3	3 19 6	5 6 11	43 8 11	36
37	2 9 8	3 0 3	3 7 7	4 1 0	5 8 11	44 4 7	37
38	2 11 3	3 1 7	3 8 11	4 2 5	5 10 11	45 0 7	38
39	2 12 11	3 3 0	3 10 5	4 4 0	5 13 0	45 17 0	39
†40	2 14 9	†3 4 6	3 11 11	4 5 8	5 15 0	46 14 0	†40
41	2 16 8	3 6 1	3 13 7	4 7 6	5 17 3	47 11 7	41
42	2 18 8	3 7 10	3 15 4	4 9 5	5 19 6	48 10 4	42
43	3 0 11	3 9 8	3 17 3	4 11 6	6 2 1	49 9 2	43
44	3 3 3	3 11 9	3 19 4	4 13 8	6 4 8	50 10 3	44
45	3 5 9	3 14 0	4 1 7	4 16 2	6 7 7	51 11 5	45
46	3 8 5	3 16 6	4 4 1	4 18 9	6 10 8	52 13 5	46
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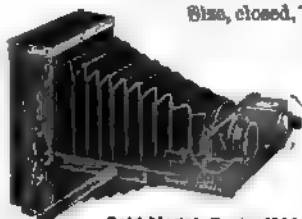
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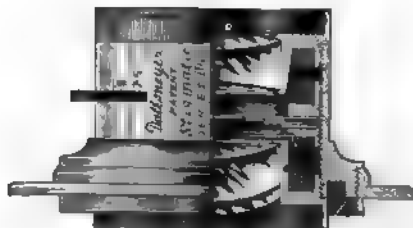
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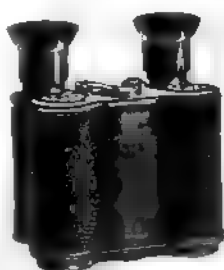
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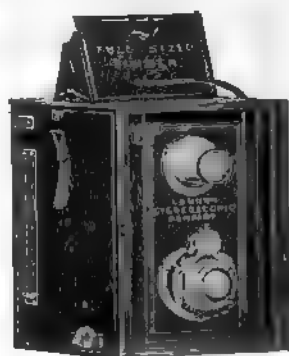
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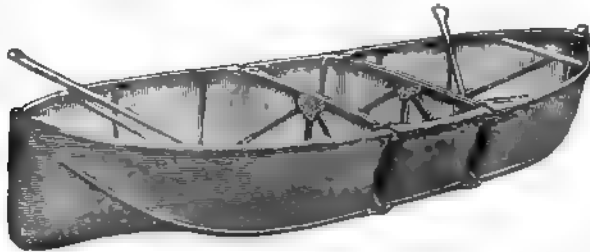
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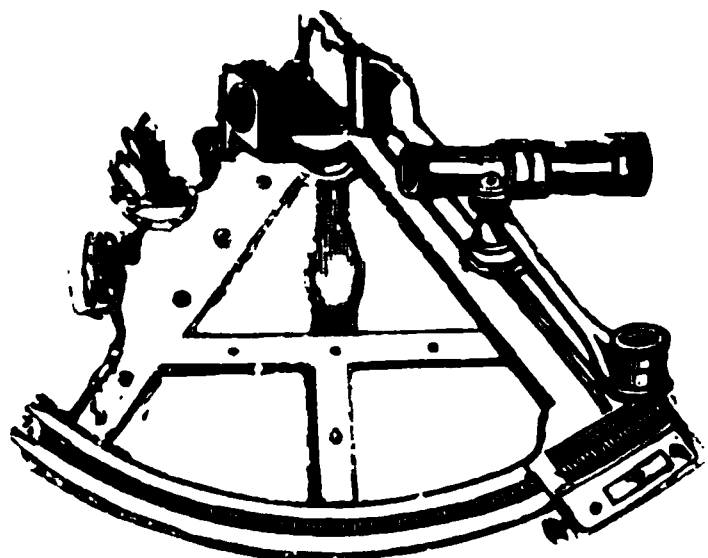
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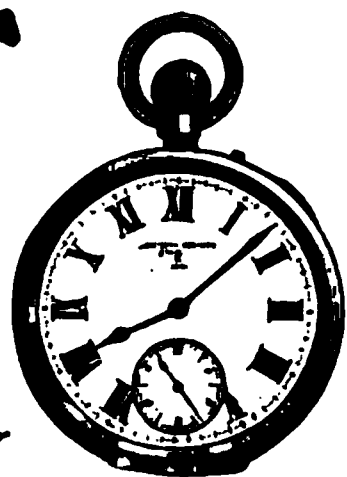
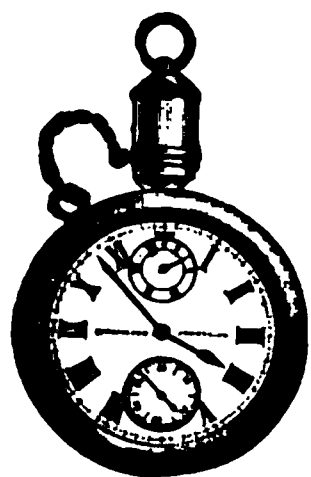
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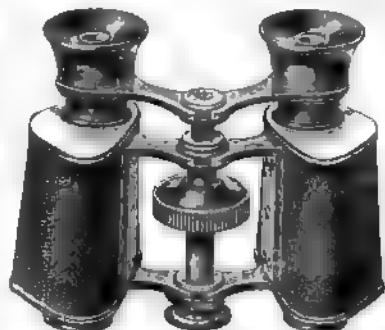
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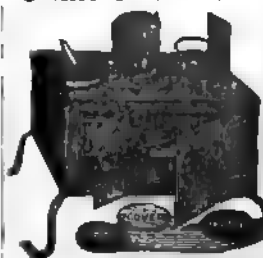
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